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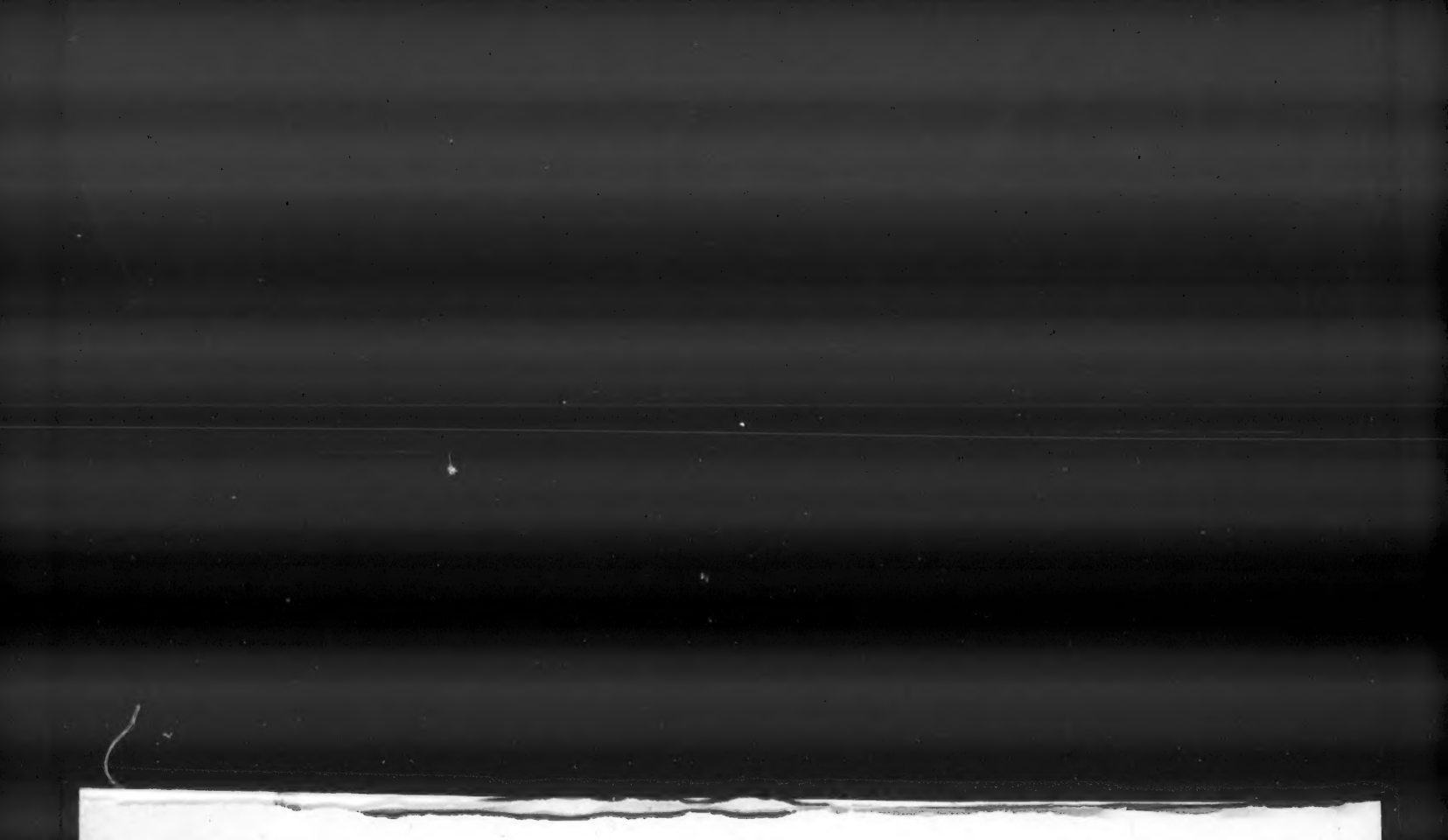

THE
QUARTERLY JOURNAL
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ECONOMICS

MAY, 1920

NITROGEN: ITS FIXATION, ITS USES IN PEACE AND WAR[1]

SUMMARY

Introduction. Some influences of the war on the supply of fertilizer materials, 391. — I. Classification and uses of nitrogen compounds, 394. — II. Sources of fixed nitrogen: Chilean nitrate, 398; coal, 401; air, 404. — III. The fixation of atmospheric nitrogen by chemical processes: arc process, 405; cyanamid process, 408; Haber process, 410; cyanide process, 414. — Summary of the situation at the outbreak of the war, 416. — IV. Developments in nitrogen fixation since the outbreak of the European war: Norway, Sweden, and Switzerland, 417; Germany and Austria, 418; Japan, Italy, France, and Great Britain, 420; United States, 422. — V. The future policy of the United States, 423.

THE nitrogen fixation plants built by the government during the great war at a cost of about one hundred million dollars, to supply materials needed for making explosives and poisonous gases, have been idle since the Armistice. These plants could be utilized, whether sold to private corporations or operated by the government, for the fixation of atmospheric nitrogen for industrial and agricultural purposes, and thus greatly

[1] The inquiries which have led to this paper were begun while the author was in charge of the chemical division of the United States Tariff Commission. In the preparation of the paper Mr. C. R. DeLong, of the present staff of the Tariff Commission, has given invaluable aid. He has contributed not only to the statistical material and its verification, but to the discussion of the larger questions of chemical progress and industrial policy.

increase the supply of nitrogen compounds needed in the industries, and stimulate the production of food through supplying nitrogen for the manufacture of fertilizer. The present anomalous situation in the government plants gives occasion for a survey of the remarkable chemical developments of recent years and of their importance for war and for peace.

Nitrogen, tho the most important element needed for an adequate supply of fertilizer, is not the only one essential. Two others are also important: potash and phosphoric acid. All must be chemically combined in such a way as to be available as plant food.

Before the outbreak of the war potash was obtained entirely from Germany, at a price maintained substantially above the cost of production by a German monopoly. Exports from Germany ceased early in 1915, and prices in the United States promptly rose to about ten times normal. Existing stocks were thereafter largely diverted to chemical uses, and relatively insignificant amounts were used in fertilizer from 1916 up to and including 1919. In the United States, England, Chile, and Japan potash is now obtained from many different geological and botanical sources, and is being recovered as a by-product of several industries. Altho many of these new enterprises will probably not survive competition with the German and the Alsatian mines, because of inherent geological and geographical disadvantages, some, at least, will recover potash, as a by-product, at a low cost. Furthermore, altho the deposits in Alsace are not so extensive as the vast potash deposits near Stassfurt, Germany, they are as good in quality, can be mined as cheaply, and are ample in quantity to supply the total needs of the world for a century. The German monopolistic control over prices is definitely broken, and the American consumer will benefit thereby.

Phosphoric acid is obtained from phosphates of lime, which are derived either from natural deposits of phosphate rock or from bones of animals by means of treatment with sulphuric acid, this treatment making the phosphate more soluble and therefore more available as plant food. During the war there was no shortage of phosphate rock. Indeed, more than half of the world's supply is normally mined in the United States, and a considerable fraction of the output was, prior to 1914, exported to Germany. The loss of this export market resulted in decreased total output but also in ample supplies and low prices for domestic consumers.

Since sulphuric acid in enormous amounts was required for the manufacture of explosives, much of our supply was diverted from the making of fertilizer to direct war use. However, most manufacturers of fertilizer make the acid they need, and hence this diversion did not result in direct financial loss. But their regular business was disorganized and their customers suffered from the disruption. As a direct result of the war demands for sulphuric acid the productive capacity for the manufacture of sulphuric acid in the United States is now more than twice what it was in 1914. This new productive capacity can be utilized completely only through a great increase in the consumption of acid phosphate. Moreover, the war stimulus to the mining of pyrites and sulphur has greatly increased the domestic supply of the raw materials (particularly sulphur) for the making of sulphuric acid. Before the war sulphuric acid was made chiefly from Spanish pyrites. The scarcity of shipping and the doubling of the demand for sulphuric acid necessitated a shift to the use of American sulphur as the principal raw material. There are many indications that the greatly enlarged American sulphur industry will retain its new outlet and that the

competitive struggle between the producers of domestic sulphur and of Spanish pyrites, which may confidently be expected as soon as ocean shipping rates become normal, will make sulphuric acid available to the manufacturers of fertilizer in large amounts and at low prices.

Most important, however, are the changes affecting the fertilizer industry which have occurred in the development in nitrogen production. It is with this development that the present paper is primarily concerned.

Nitrogen in chemically combined form in the soil is essential to the growth of all plants. Indeed the limiting factor in the fertility of soil is commonly a deficiency in nitrogen, which is normally the most expensive ingredient per unit in fertilizer. Owing to the chemical instability of its compounds, and the relatively large requirements of plant growth, nitrogen is lost from the soil more rapidly than either potash or phosphate, and must be systematically restored.

Furthermore, in addition to the vital importance of nitrogen in the fertilizer industry, its compounds play an essential rôle in many chemical industries, and there will continue to be competition between the agricultural and the industrial demand for this element and its compounds.

I. Classification and Uses of Nitrogen Compounds

The many hundreds of nitrogen compounds of agricultural or industrial importance may be conveniently considered in four groups:[1] (1) proteins; (2) nitrates and nitric acid and derivatives thereof; (3) ammonia and its compounds and derivatives; (4) cyanides and their compounds and derivatives.

[1] This classification is not rigidly exact, because there are a relatively small number of compounds which may not fit into any of these classes, such as, pyridin; and a few may fit into more than one class, for example, ammonium nitrate.

1. Proteins, as is well known, include the principal forms in which nitrogen exists in the bodies of plants and animals. Wool, silk and leather are proteins. Of even greater importance are the digestible proteins, which are present in flesh, in grains and in many vegetables and are an essential constituent of the food of all animals. The fertilizer industry utilizes much waste protein material which is unsuitable for food because of its unsanitary quality.

2. Crude sodium nitrate is one of the most important raw materials for commercial fertilizer.

Nitrates, or nitric acid, are essential for the manufacture of old-fashioned black gunpowder, modern smokeless powder, dynamite, mercury fulminate and other substances used as primers, the high explosive bursting charges for shells, torpedoes and depth bombs, such as trinitrotoluene (T.N.T.), picric acid, ammonium picrate, and ammonium nitrate, and nitro-starch used in hand grenades. Altho there are explosive substances which do not require nitric acid for their manufacture, none of them was utilized to any appreciable extent in the recent war, because of serious disadvantages which precluded their use. Nitric acid or a nitrate is indispensable for the manufacture of each and every explosive of any military value and is important in pyrotechnic signals. An adequate supply of nitrates or nitric acid is therefore an essential part of any military program, should it be necessary, alas, to consider military requirements hereafter.

Nitric acid (or nitrates) is also required for the manufacture of potassium nitrate and of pyroxylin plastics such as celluloid, certain varieties of moving picture films, most dyes, and many other products derived from coal tar, as well as for scores of minor uses. Considerable amounts are also required for the manufacture of sulphuric acid.

3. Salts of ammonia, especially the sulphate, are much used in fertilizer, this use being quantitatively much larger during times of peace than all the other uses of ammonia put together.

Ammonia is utilized in many industrial operations, as for example in the manufacture of artificial ice. Artificial refrigeration by means of ammonia within the last few years has well-nigh revolutionized the distribution of food. Its use is already common in some industries in which the product must be kept chilled during manufacture. The artificial cooling, during the summer, of hotels, theaters, offices, and factories, and even homes, may become common within a decade or two. Artificial cooling of buildings in summer is more expensive than their heating in winter. Complicated machinery and skilled attention are required. These factors are a serious obstacle to the introduction of the process in homes but not prohibitive in hotels, theaters, or factories.

Other salts of ammonia, particularly the nitrate and picrate salts, are extensively used as high explosive shell fillers in warfare and in mining operations. Ammonia is also used as a household cleansing agent and for many purposes in medicine and in the chemical industries. A method has recently been developed for converting ammonia into nitric acid. This method has reached its highest development in Germany and during the war it enabled the Germans to make explosives from ammonia rather than from Chilean sodium nitrate.

4. Cyanides are not used as an ingredient in fertilizers. They are used, in the "cyanide process," for extracting gold from its ores. The discovery of this process in 1887 has been mainly responsible for a fourfold increase in the annual output of fresh gold. Cyanide is also largely used in the electroplating of metals,

especially gold and silver, in the case-hardening of steel, and in the manufacture of certain pigments; and furthermore in the destruction of insect pests and vermin, particularly in the fumigation of citrous fruit trees. At one time cyanides were also in considerable demand for use in poison gas warfare, but they did not prove to be as effective as several other substances. If obtainable cheaply enough, they may serve as a source of ammonia, formic acid, and oxalic acid. At the present time the amount of cyanides used is only a small percent of the consumption of nitrates or ammonia.

II. Sources of Fixed Nitrogen

Considerable amounts of nitrogenous materials of organic origin such as manure, cottonseed meal, dried blood, tankage, leather scrap, and tobacco stems are used as fertilizer. But since the nitrogen in these materials is all derived directly or indirectly from the soil its return to the soil is merely a partial repayment of nitrogen already removed therefrom. Altho the maximum utilization of these materials is important, considerable losses are inevitable and must be made up from other sources. Fish scrap and kelp derived from the sea furnish a net gain of nitrogen to the land, but on a scale insufficient to compensate for inevitable losses. It is, therefore, apparent that in order to meet the urgent demands for nitrogen needed to maintain the fertility of our soils, we must turn to sources other than these waste materials of animal or plant origin.

Supplies of chemically combined nitrogen necessary to maintain the fertility of the soil and to meet the industrial demands are obtained almost entirely from three sources: sodium nitrate [1] mined in Chile, ammonia

[1] Also called "niter" or "Chilean saltpeter." True "saltpeter" is potassium nitrate.

obtained as a by-product in making coke and illuminating gas from coal, and nitrogen from the air, which may be made available either by chemical operations or by legumes. It is the development and expansion of these sources of nitrogen on which we must depend for our future requirements of fixed nitrogen for agricultural, industrial and military purposes.

Chilean Nitrate

Nitrates are found naturally, in amounts which warrant extraction on a commercial scale, in only two countries in the world, Chile and India. Potassium nitrate is extracted from the soil of India for sale and export, but in amounts which are insignificant in comparison with the production of sodium nitrate in Chile. The following table shows the situation:

CHILEAN AND INDIAN NITRATE STATISTICS

(Short tons)

Year	Chile					India
	Production [1]		Exports of nitrate of soda [2]	Revenue from export duty [2]	Per cent of total revenue of Chile [3]	Exports of saltpeter—potassium nitrate [3]
	As nitrate of soda	Equivalent of nitrogen on basis of 15.65%				
1913	3,055,808	478,234	3,015,479	$32,896,947	48	17,062
1914	2,715,047	424,905	2,034,374	23,751,756	52	15,998
1915	1,935,143	302,850	2,227,599	24,564,128	59	23,442
1916	3,210,008	502,366	3,280,660	36,599,903	59	27,158
1917	3,319,918	519,567	3,055,180	38,892,824	50	28,860
1918	3,170,106	496,122	3,289,325	40,333,936	44	26,296
1919 [4]	556,817	87,142	167,328	.....	..	....

[1] For 1913–16 inclusive from Association Salitrera de Propaganda; 1917–19, from publications of International Institute of Agriculture, Rome, Italy.

[2] From Caliche, Organo del Instituto Cientifico E Industrial del salitre, Santiago, Chile, August, 1919.

[3] From publications of International Institute of Agriculture, Rome, Italy.

[4] First three months.

CONSUMPTION OF CHILEAN NITRATE BY COUNTRIES IN 1913[1]

Country	Per cent of total	Country	Per cent of total
Germany	32.6	Italy	2.0
United States	23.0	Egypt	1.0
France	12.8	Spain	.5
Belgium	12.5	Austria Hungary	.3
Holland	6.4	Denmark	.4
United Kingdom	5.0	Others	3.5

These Chilean nitrate deposits are located in a district where rain rarely falls and no vegetation grows. They are found near the surface and can be dug from open pits. The refining operations consist of extraction from the earthy material by solution in water and purification by recrystallization. All the water needed for the refining operations and for the life of the miners must be brought from a distance. The industry employs on an average in normal times about 55,000 workmen.

The extraction of nitrate in Chile began about 1830, and has had a steady growth. The annual output had attained to approximately 3,000,000 tons at the outbreak of the war. About two thirds of this was used directly for fertilizer and one third for industrial chemical purposes including the manufacture of explosives.

At the outbreak of the war a German fleet of five cruisers under Admiral von Spee, stationed off the coast of Chile, dominated the South Pacific ocean and entirely prevented any shipments of sodium nitrate. On November 1, 1914, Admiral Craddock, with a fleet of three ships, altho hopelessly outclassed in gun power, attacked the Germans and sacrificed his ships in a vain effort to open the path for nitrates to England and to

[1] Calculated from statistics taken from Production et Consommation des Engrais Chimiques dans le Monde, Institut International d'Agriculture, Rome, Italy.

the United States. A superior English fleet under Admiral Sturdee was soon despatched to the scene and on December 8, 1914 met and sank the Germans in the battle of the Falkland Islands, thus making it possible for exports of nitrate from Chile to be resumed.

In the meantime, the mines and refineries in Chile finding their market cut off had curtailed their output. Thus the output of the most important raw material for the manufacture of military explosives showed a marked decrease in the first six months after the outbreak of war.

The Chilean government imposes an export duty amounting to $11.19 per net ton (3.38 pesos gold per 100 kilos) on all sodium nitrate exported. This tax normally yields the Chilean government about $30,000,000 per year, or approximately half of the total revenue, and in addition the government derives revenue from the sale of the lands.[1] It is obvious that if the methods for making nitrates from the air should succeed sufficiently to threaten seriously the Chilean industry, the government of Chile might be forced to reduce or entirely eliminate the export tax in order to maintain the industry on which the prosperity of the country largely depends. The possibility of a reduction or elimination of the export tax on Chilean nitrate compels a more conservative judgment on the prospects of the new methods for obtaining nitrogen from the air. However, it is hardly probable that the tax will be reduced unless this action is forced on the Chilean government by the development of the newer methods to such an extent that their competition is sharply felt by the nitrate industry.

Estimates of the reserves of nitrate in Chile vary greatly, and indeed no very accurate estimate is possible

[1] Incidentally it may be worth mentioning that almost the total world's supply of iodine (about two million pounds per year) is obtained as a by-product of this industry and yields the government nearly half a million dollars as export duty.

because of the local variation in the thickness and richness of the nitrate deposits and the incompleteness of the surveys. An official report made in 1913 to the Chilean government by the Inspector-General of Nitrate Deposits concludes with the statement: . . . "There is no fear of the Chilean nitrate deposits being exhausted for 200 years."

Coal

Until very recently commercial supplies of ammonia and its compounds were obtained almost entirely as a by-product of the coking of soft coal. Ammonia is obtained in the United States in part from city gas plants but mainly as a by-product of coke ovens. Relatively insignificant amounts are obtained from other sources such as sewage and garbage disposal plants and the distillation of bones and oil shales. For many years the oil shales of Scotland have yielded about 15 per cent of the British output of ammonia but shales have been little used elsewhere. There are enormous reserves of oil shales in the United States which may in the future yield considerable ammonia in case they are utilized on a large scale as the source of fuel oil. Indeed, the utilization of oil shales on a large scale can hardly be delayed for more than a few decades unless new and very prolific oil fields are discovered. The output of ammonia in the United States during 1918 was equivalent to nearly one hundred thousand tons of pure ammonia. This was marketed chiefly in the form of ammonium sulphate containing 25 per cent of ammonia, the form in which ammonia is commonly used for fertilizer. About one-half (54.0 per cent in 1918 and 43.8 per cent in 1919) of the metallurgical coke produced in the United States is still made in the old-fashioned beehive ovens, which waste all of the by-products — ammonia, benzol, toluol,

coal tar and coal gas. The output of the by-product ovens has been rapidly overhauling the output of the old style beehive oven and it is not unreasonable to expect that within one or two decades the by-products will be saved from all the coke produced in the United States, as has been done in Germany for many years.[1]

PRODUCTION OF BY-PRODUCT AMMONIA IN PRINCIPAL COUNTRIES
(Short Tons of Ammonium Sulphate)

Country	1913	1914	1915	1916	1917	1918
United States[2]	190,922	181,569	249,049	288,265	326,166	377,913
United Kingdom[3]	484,532	477,581	477,419	485,747	513,651	484,457
Germany[4]	605,163	456,173[5]	[6]	[6]	[6]	[6]
France[4]	82,121	....	46,297	27,557	37,478	33,069
Japan[4]	8,818	17,675	35,080	42,111	63,840	100,799
Canada[4]	10,607	8,571	10,448	....	....	....
Italy[4]	14,802	15,789	16,203	16,535	9,921	11,023
Australia[4]	6,048	6,328	7,168	7,952	....	....
Netherlands[4]	7,716	5,512	5,512	4,409	....	....
Spain[4]	16,535	17,637	18,188	19,841	14,054	....
Russia[4]	15,222	18,933	18,056	36,111	....	....
Austria-Hungary[4]	38,580	38,580	38,580	....	....	....

[1] The following table shows the fraction of the United States output of coke produced in by-product ovens, as compiled by the Geological Survey:

1890	0	1916	35.0
1900	5.3	1917	38.6
1905	10.7	1918	46.0
1910	17.1	1919	56.2
1915	33.8		

In 1919 the output of coke was sharply reduced as compared with 1918 owing to strikes in the steel and coal industries but the reduction was almost entirely in beehive coke, 9,831,000 tons or 32 per cent as compared with a reduction of only 827,000 tons or 3.2 per cent in by-product coke.

[2] From official governmental sources. In computing total for 1913 and 1916, figures published by the Barrett Company, New York, have been used for sulphate of ammonia produced in coal gas and bone carbonizing works.

[3] From Annual Reports of the Alkali Inspector, United Kingdom.

[4] From publications of International Institute of Agriculture, Rome, Italy.

[5] Total sales of members of the Union.

[6] Accurate statistics not available. Published reports do not indicate any increase in the production of by-product ammonia in Germany during the war.

American production has been supplemented by imports on a considerable scale. In 1914 the imports of ammonia were 50 per cent of the domestic production of ammonia. The imports have come almost entirely from Great Britain, which country was the largest exporter of ammonia. When the food supply of Great Britain was threatened by the submarine, export of ammonium sulphate from Great Britain ceased, because the British used this material in the form of fertilizer on their land to stimulate food production as well as for the manufacture of explosives. It is improbable that England will soon forget the importance of raising a larger fraction of her food supply at home or that she will forego the aid of ammonium sulphate in such an endeavor. America can hardly count on receiving ammonia from English coke ovens in the future.

Since ammonia is a by-product of the coke industry, the amount produced from this source will be regulated by the demand for coke and will be little influenced by the price of ammonia, except in so far as a high price for ammonia may hasten the replacement of the beehive oven by the by-product oven. But there is no prospect that the price of ammonia will go so low that it will not be profitable to recover it from existing by-product ovens. In the past whenever during periods of business depression there has been a decreased demand for coke, the beehive ovens have ceased operations rather than the by-product ovens. The growing demand for coal tar arising from the development of the American dye industry should hasten the replacement of beehive coke ovens by by-product ovens and thus yield more by-product ammonia.

The newer synthetic method for producing ammonia, to be discussed presently, will not decrease the output of ammonia from coal. If the price of ammonia is

lowered through competition, the operator of a coke oven will sell his ammonia for whatever it will bring, and the price of the coke or other by-products will have to be sufficiently high to keep the plants in operation. The economic success of the newer processes is therefore not dependent on an ability to undersell by-product ammonia. These methods can only succeed if the demand is great enough to absorb the total output of the by-product ammonia and still leave a large demand at a price sufficient to maintain the new synthetic industry.

Air

The air contains an inexhaustible supply of nitrogen, approximately twelve pounds to every square inch of the earth's surface. Free atmospheric nitrogen is comparatively inert chemically, so that it is directly available to none of our staple crops except the legumes and can only be made available for fertilizer or industrial uses by special chemical processes. Nitrogen is absorbed in the soil to some extent under favorable conditions by bacterial action. This absorption is carried out more effectively and in much larger amounts by those bacteria having a symbiotic relationship with leguminous plants. The legumes, including the many varieties of peas, beans, clover and alfalfa, utilize in their growth the nitrogen absorbed by the bacteria attached to their roots. The soil is then enriched by the plowing in of the crop or by feeding the crop to cattle and by deposition of the manure on the land. This ability of the legumes to absorb nitrogen from the air is an important reason for the rotation of crops commonly practiced by good farmers.

III. The Fixation of Atmospheric Nitrogen by Chemical Processes

In addition to the biological process of recovering nitrogen from the air there are at least four chemical processes for the fixation of atmospheric nitrogen which have been developed to the point of large scale factory operation.

Arc Process

The earliest of these to be developed successfully is the direct combination of nitrogen and oxygen of the air by means of an electric arc, resulting in the formation of nitric oxide which may then be converted into nitric acid by combination with water and with more atmospheric oxygen. For use as fertilizer the acid so made is commonly allowed to act on limestone producing calcium nitrate or nitrate of lime. This material unfortunately has a tendency to absorb water from the air, a characteristic which makes it necessary to ship it in sealed containers instead of in bulk or in bags. The tendency to absorb water also seriously interferes with its distribution on the land as the machinery commonly used in the United States will operate successfully only when using dry powders. However this difficulty has recently been lessened by a change in the method of manufacture which yields a product containing excess of lime.

The direct combination of oxygen and nitrogen requires very high temperatures, such as are attained only in the electric arc, and very large amounts of energy must be supplied at this high temperature in order to make the combination possible. Moreover, in none of the furnaces has it been possible to secure a yield of more than 2 per cent of nitric oxide in the air issuing from the

furnace and 1¼ to 1½ per cent is the usual yield. The large excess of air which escapes chemical combination must be heated to the temperature of the arc. This process therefore necessarily requires large amounts of power in proportion to the yield of fixed nitrogen, estimated at 8.4 kilowatt-years per metric ton of fixed nitrogen. It is stated that only 3 or 4 per cent of the electrical energy is actually utilized in the union of nitrogen and oxygen. An expensive equipment is also required to remove the oxides of nitrogen from the large excess of air and to produce saleable products. Nitric acid is the primary saleable product of the arc process, from which nitrates for fertilizer can be made only by the use of additional materials, equipment and labor, and therefore at a cost above that of nitric acid. Conversely, nitrates are the primary and therefore the cheapest product of the Chilean industry, and nitric acid is a secondary product, whose production entails additional cost. The arc process, even in localities where it is dependent on coal for power, may perhaps be able to produce its primary product, nitric acid, in competition with that manufactured from Chilean nitrate.[1] But the arc process, except in places where power is unusually cheap, cannot produce its secondary product, nitrates for fertilizer, in competition with the primary product of the Chilean industry, sodium nitrate. On the other hand, the arc process has many advantages over the other methods to be presently described. The only raw materials required for nitric acid are air and water, available for the mere cost of pumping. If the product is to be sold as fertilizer, limestone is also required but this is one of the cheapest of minerals. The furnaces have been so perfected that they operate automatically

[1] See Final Report of Nitrogen Products Committee, Ministry of Munitions of War (British), par. 190, 202.

for indefinite periods, requiring no direct labor, very little supervision, and repairs only at long intervals. This process yields nitric acid as its primary product, which has certain advantages both from a military and agricultural point of view. Unfortunately nitric acid is more difficult and expensive to ship than ammonia, which is the primary product of most of the other processes.

The direct process has been financially profitable, and has had a substantial growth in Norway and some development in the Alps. Abundant water power is available in Norway at an exceptionally low price, owing to the fact that the natural conditions permit the development of water power with relatively little capital investment for dams, reservoirs, and other engineering developments; and because there are no highly developed industrial centers at hand containing large consumers of power who are able and willing to pay a higher price. For these reasons power is available for the fixation of nitrogen in Norway at a price or cost of only about one-third ($4.30 to $10 per kilowatt-year) of the lowest price at which power can be purchased at Niagara Falls.

Three other small factories to operate the direct arc process have been erected in Europe — one in France, one in Italy, one in Austria. These have apparently not been so successful as the Norwegian plants. A plant erected in North Carolina was abandoned because it proved to be more profitable to sell the power for other uses. A small plant (making sodium nitrite for the dye industry) has been built recently near Tacoma, Wash., by the American Nitrogen Products Company, utilizing " off-peak " power during the part of the day when demand for lighting and power is low. Such a surplus of power, if not utilized, will be lost, and may therefore be

sold at a low figure. Water which goes over the dam at two o'clock in the morning instead of through the water turbines is permanently lost. As the generating machinery and distributing system of a company supplying power to a city must be constructed on a scale large enough to carry the maximum load during any hour of the entire year, a large surplus of power may be available during a considerable fraction of the time. Since the utilization of the machinery during " off-peak " periods involves no extra interest or overhead charges, and in the case of water power plants even no extra charge for fuel, the " off-peak " power can be sold at very low rates. The arc nitrogen process has certain advantages for utilizing this " off-peak " power because very little labor is required and the furnaces can be quickly started or stopped without serious difficulties. Capital charges on idle plant constitute the most serious obstacle to the use of " off-peak " power in this case.

Cyanamid Process

Another process is based upon the fact that calcium carbide at a temperature of about 1200° C. will chemically combine with nitrogen gas to form calcium cyanamid, which may be used directly as fertilizer or may be converted into ammonia by treatment with steam and alkali under pressure. The fundamental raw materials are limestone, coal, water and air, together with electrical power. The first operations are to convert the coal into coke and burn the limestone to quicklime. The lime and coke are then mixed and heated to a high temperature in an electric furnace, thereby forming calcium carbide. This carbide must be ground to a very fine powder and transferred to another furnace where it is changed into cyanamid by combination with nitrogen.

The nitrogen used is obtained from air, but must be freed from oxygen. This separation is best accomplished by the liquifaction of the air, followed by fractional distillation. The chemical combination of the carbide and nitrogen must be started by heating the carbide locally to a temperature of about 1200° C., whereupon the reaction begins. The external power may then be turned off because the heat produced by the reaction itself is sufficient to raise the remainder to the desired temperature. The crude calcium cyanamid thus produced requires only to be ground and treated with a little water and oil to prepare it for use as fertilizer or in the manufacture of mixed fertilizers. The cyanamid may also be used for the manufacture of ammonia by treatment with dilute alkali and steam under pressure. By fusion with salt it yields a crude cyanide which is, however, pure enough for use in gold recovery. By still other chemical processes it yields urea which is used in the manufacture of celluloid and as a drug. As compared with the arc process the cyanamid process has the great advantage that the power required is only about one-fourth as great in proportion to the weight of nitrogen fixed (1.97 to 2.30 kilowatt-years [1] per metric ton of fixed nitrogen). On the other hand, the cyanamid process requires coke for the manufacture of carbide in addition to the limestone, water, and air required by the arc process. It yields nitric acid only indirectly through ammonia by another process to be subsequently described.

The cyanamid process secured its commercial start at about the same date as the arc process and has had a substantial development, particularly in Europe.

Calcium cyanamid may be used directly in fertilizers but there are certain serious objections to its use for such purposes. When used with acid phosphate it will in time

[1] See Final Report of Nitrogen Products Committee, loc. cit., par. 108.

WORLD'S PRODUCTION OF CALCIUM CYANAMID [1]
(Short tons)

Country	1913	1914	1915	1916	1917	Actual production 1918	Productive capacity of works completed or under construction 1918
Germany	26,455	(39,683)	(551,150)	(551,150)	440,920	330,690	(661,380)
Austria-Hungary	8,267	(26,455)	(26,455)	(26,455)	26,455	26,455	(33,069)
France	8,267	(8,267)	(88,184)	(110,230)	110,230	110,230	(330,690)
Italy	16,515	17,147	27,879	27,673	13,558	16,534	(88,184)
Norway	24,372	16,171	27,557	29,111	220,460[2]	220,460[2]	(220,460)[2]
Sweden	20,229	(19,841)	(18,037)	19,841			
Switzerland	8,267	(8,267)	(13,779)	(32,518)	44,092	44,092	(71,650)
Canada	52,910	(63,933)	(63,933)	(63,933)	63,933	63,933	(63,933)
Japan	7,716	12,314	33,375	36,885	55,999	55,115	111,999
Totals	172,999	(212,079)	(850,351)	(897,797)	975,648	867,509	(1,581,365)
Total calculated as nitrogen [3]	31,140	(38,174)	(153,063)	(161,603)	175,617	156,152	(284,646)

produce undesirable chemical reactions which render the phosphate less soluble and therefore less available to plants. It is an unpleasant and irritating material to handle. It is probable that in the future much of the cyanamid produced will be converted into ammonium sulphate or ammonium phosphate, which will then be used in fertilizers instead of the cyanamid itself.

Haber Process (Direct Synthesis of Ammonia)

The direct combination of nitrogen and hydrogen in such way as to yield ammonia was developed by the German chemist, F. Haber, and was put into operation in Germany on a commercial scale for the first time in 1913. It requires pure nitrogen and hydrogen as raw materials. The nitrogen may be obtained by the fractional distillation of liquid air or from producer gas.

[1] From Publications of International Institute of Agriculture, Rome, Italy. Figures in parentheses are estimated productive capacity. [2] Norway and Sweden.

[3] Calculated on basis of 18 per cent of nitrogen in calcium cyanamid.

The preparation of the hydrogen of the required degree of purity is one of the most troublesome and expensive parts of the process. Hydrogen may be obtained as a by-product of the electrolytic production of chlorine, but in amounts insufficient to supply an ammonia industry adequate to meet the fertilizer demand.

A mixture of hydrogen and nitrogen may be made by passing a blast of steam and air through red hot coke (heated by a blast of air at intervals), which yields a mixture of hydrogen, nitrogen, carbon monoxide, and carbon dioxide. By a subsequent treatment, too complex to be described here, the carbon monoxide is converted into carbon dioxide, which may be easily removed, leaving a pure mixture of hydrogen and nitrogen.

The pure nitrogen and hydrogen are then subjected to a pressure varying from one hundred to two hundred atmospheres and passed over a suitable catalyst at a temperature of about 550° C. Under these conditions chemical combination of the nitrogen and hydrogen to form ammonia occurs to the extent of about 5 per cent of the gases present. The product is then cooled while still under pressure and dissolved in water. After this the uncombined gases are returned to the apparatus and treated a second time. The process evolves sufficient heat to maintain the temperature of the apparatus after it is once started, and this gives it an advantage over all other nitrogen fixation processes in the relatively small amount of power required. The power required is only about 0.4 kilowatt-years per ton of nitrogen fixed, which is about one-twentieth of that required by the arc process, or about one-fifth of that required by the cyanamid process per ton of nitrogen fixed. Its commercial development is therefore not dependent on cheap power. The preparation of the catalyst, the purification of the

gases and the design of an apparatus which would stand the necessary temperatures and pressures required scientific and engineering work of a high order. The successful development of this process ranks as one of the greatest achievements of German industrial chemistry. The primary product of the process is aqua ammonia of a purity far surpassing that yielded by either coke ovens or the cyanamid process. For use in fertilizer it is usually combined with sulphuric acid and sold as ammonium sulphate.

Wilhelm Ostwald, one of the great leaders of German science, has developed a method for the conversion of ammonia into nitric acid. The process consists essentially in passing a mixture of ammonia and air through a platinum gauze maintained at a low red heat, thereby converting the ammonia into nitric oxide which may be readily converted into nitric acid.

The Haber process was perfected and put into commercial operation in Germany in 1913, by the Badische Anilin und Soda Fabrik. The Ostwald process had been developed some years previously, but not operated continuously on a commercial scale and was held in reserve as a military asset. Technically it was successful, but not commercially. The military significance of the combined Haber and Ostwald process cannot be overestimated; it made Germany independent of Chilean nitrate for the manufacture of explosives. The Haber plant was a demonstrated technical and commercial success before the outbreak of the war and the company controlling it is known to have been seeking long term contracts for future delivery outside of Germany in anticipation of enlargement of the plants. After the outbreak of the war these plants were rapidly extended and there can be little question that without them the German army must have suffered defeat not later than 1916

through a shortage of explosives. Moreover, the Haber process has great possibilities along a line quite different. Recent work has indicated very clearly that a combination of the Haber process and the Solvay soda process will be of great benefit to both. To explain in detail the benefits of this combination would require an elaborate exposition of the chemistry of both of these processes, and thus be outside the scope of this paper. It need merely be said that these two processes are to a considerable degree complementary. A waste product of each process can be utilized in the other in the place of a material that must otherwise be especially prepared or purchased for the purpose with the result that when operated together both are simplified and cheapened. The combination process requires only air, coke, water, and salt as raw materials; and yields soda, ammonium chloride, and oxygen as products — the ammonium chloride being used for fertilizer instead of ammonium sulphate, as was originally done in Haber plants.

Since soda ranks second only to sulphuric acid among all chemicals in magnitude of output (1,390,628 short

PRODUCTION OF AMMONIA BY HABER PROCESS [1]

Production in short tons

Year	Ammonium sulphate	Calculated as nitrogen [2]
1913	33,000	7,000
1914	66,000	14,000
1915 [3]	165,000	34,000
1916	331,000	68,000
1917	551,000	113,000
1918 [4]	.....	(215,000)

[1] From Frankfurter Handelsblatt, May 29, 1916. Published in Final Report of Nitrogen Products Committee, Ministry of Munitions of War, Great Britain.

[2] Calculated on basis of 20.58 per cent of nitrogen in ammonium sulphate.

[3] Rate of production by the middle of 1915.

[4] Estimate from private sources.

tons in the United States in 1918) and fundamental importance, the combination of the two processes places the synthetic production of ammonia on a new and much more promising basis. Indeed this may well prove to be the most significant development in industrial chemistry of the present decade.

Cyanide Process

The only other process which merits discussion is the Bucher process, which depends upon the fact that when soda, carbon, and iron are intimately mixed and heated to a red heat in the presence of nitrogen gas the nitrogen is rapidly absorbed, resulting in the formation of sodium cyanide mixed with the unchanged iron. The iron takes no direct part in the reaction but the reaction will not occur with any useful speed in the absence of iron. Altho considerable difficulty has been encountered in the operation of this process, it has been developed on a commercial scale so recently that experience with it is very brief but the best available information indicates that the difficulties are not fundamental but can be surmounted by changes in detail of design. The process appears to be the most rational method known for the manufacture of cyanides. Its development up to the limits of the cyanide market may be predicted.

There is also a possibility that this process may produce sodium cyanide at a cost low enough to make it a suitable raw material for manufacture of many other chemicals now made by quite different methods. If sodium cyanide is steamed, it yields ammonia and sodium formate. Sodium formate in turn will serve for the manufacture of formic acid, for which a market of many million pounds per year could easily be developed if its price could be lowered substantially. Sodium formate

may also be readily converted into sodium oxalate and this in turn into oxalic acid. Both the oxalic acid market and the formic acid market of the world were dominated by German manufacturers before the war; the new process may destroy this German advantage. The output of ammonia from the Bucher process may not, however, necessarily be limited by the market for formic and oxalic acids. By the action of air and steam at a low red heat, sodium cyanide yields ammonia and soda. Since the soda obtained may be used over and over again in the process itself with consequent reduction in cost of raw material, the development of the process, if financially successful, is limited only by the demand for ammonia. At present there is little prospect that ammonia can be made as the principal product by this method, but it may be produced as a by-product of the manufacture of formic and oxalic acids.

Bucher even dreams of revolutionizing the process of making steel, and obtaining sodium cyanide as a by-product of a new steel-making process. Pig iron, the primary product of the iron and steel industry, contains about 4 per cent of carbon. The process of making steel consists essentially in reducing the carbon content to a figure varying from about one-tenth of 1 per cent to 2 per cent, according to the variety of steel desired. In the Bessemer converter, the carbon is burned out by blowing a blast of air through the molten pig iron. Bucher hopes to replace this air blast by a blast of nitrogen carrying powdered soda and thereby to remove the carbon as sodium cyanide. Sodium cyanide thus produced would be so cheap that it might be converted by treatment with steam into ammonia for fertilizer, and soda for reuse in the steel-making operation. Since this process has not yet passed the laboratory stage, prediction of success would be rash. However, chemical sci-

ence has to its credit scores of triumphs inherently no more difficult or improbable than this. There is at least a hope that, within the next decade or two, the steel industry may yield large amounts of nitrogen fertilizer material as a by-product.

Summary of the Situation at the Outbreak of the War

At the outbreak of the war the situation in regard to the development of the four processes outlined was briefly as follows:

The arc process had been successfully developed in Norway on a considerable scale in three large plants and there were smaller plants located in France, Italy, and Austria. The combined production may be estimated at about 19,000 tons of fixed nitrogen per year. The growth of the industry had been limited by the scarcity of power available at a price low enough to be attractive to this process. Altho some experimental work had been done in the United States on a fairly large scale, there was no plant in successful commercial operation.

The cyanamid process had developed on a scale perhaps three times as large as the arc process with an actual output of about 31,000 short tons of fixed nitrogen. (See page 410.) As this method is not so dependent on cheap power the plants were more widely distributed, being located in Norway, Sweden, Switzerland, Germany, Italy, France, Canada, Japan, and Austria. There was no plant in the United States but a large plant at Niagara Falls, Canada, had been erected with capital and personnel derived from the United States, and a large part of the product was sold in the United States.

The Haber process was in operation in a single plant in Germany and many of the technical details were not

known to outsiders. The output from this process in Germany prior to the war (1913) has been reported as about 7000 tons of nitrogen or about one-third of that of the arc process.

The Bucher process was only in the early laboratory experimental stages and no serious attempts had yet been made to develop it on a large scale.

The following table shows the world's resources in fixed nitrogen compounds during 1913, the figures all being expressed in terms of short tons of fixed nitrogen to make them comparable (in part they represent productive capacity at close of 1913 instead of actual production).

NITROGEN INDUSTRIES COMPARED IN 1913 [1]

Product or process	Production or estimated productive capacity in terms of short tons of fixed nitrogen
Chilean nitrate	429,897
By-product ammonia	319,667
Calcium cyanamid	66,138
Arc process	18,739
Haber process	6,614
Total	841,055

IV. DEVELOPMENTS IN NITROGEN FIXATION SINCE THE OUTBREAK OF THE EUROPEAN WAR

Norway, Sweden, and Switzerland

Among the neutral nations Norway held the leading position before the war in the fixation of atmospheric nitrogen. Plants operating both the arc process and the cyanamid process were in operation in Norway during 1913, the product being sold in the form of nitrate of lime, calcium cyanamid, and ammonium nitrate. The ammonium nitrate is made from cyanamid-ammonia

[1] From Final Report of Nitrogen Products Committee, Ministry of Munitions of War, Great Britain.

and nitric acid (made by the arc process). The development during the war is shown by the following table:

STATISTICS OF NORWEGIAN NITROGEN INDUSTRY [1]

(Short tons)

Product exported	1913	1914	1915	1916	1917
Ammonium nitrate	10,039	13,182	29,166	65,740	70,082
Nitrate of lime	78,183	82,866	42,559	50,707	39,596
Calcium cyanamid	24,373	15,124	27,126	14,497	2,550
Total export expressed as nitrogen [2]	18,065	18,109	20,624	32,210	33,993

The rapid growth, shown in the table above, in the production of ammonium nitrate accompanied by a drop in the other products reflects the military demand for ammonium nitrate. When computed in terms of fixed nitrogen, in 1913 about 18,000 short tons of nitrogen were fixed and by 1917 the amount had increased to about 34,000 short tons of nitrogen in Norway. The production of cyanamid in Sweden, which was 613 short tons [3] in 1911, reached 20,229 short tons in 1913 and in 1917 was more than 110,000 tons according to the best available estimates. In Switzerland the output of cyanamid was 8,267 short tons in 1913 and rose to 44,092 short tons during 1918.

Germany and Austria

Germany during the war relied on the development of the Haber and cyanamid processes to supply her with

[1] Published in Final Report of Nitrogen Products Committee, Ministry of Munitions of War.

[2] Calculated on basis of 35 per cent of nitrogen in ammonium nitrate, 13 per cent in nitrate of lime, and 18 per cent in calcium cyanamid.

[3] This figure and most of the others quoted on this and the following pages are taken from the Report of the Nitrogen Products Committee, Ministry of Munitions of War (British).

the necessary requirements of fixed nitrogen. The output in Germany by the Haber process increased from about 7,000 short tons in 1913 to about 215,000 short tons in 1918. The output by the cyanamid process increased from 4,760 short tons of fixed nitrogen in 1913 to 60,000 tons in 1918. It has been estimated that when finally completed the annual output of fixed nitrogen by plants under construction during the war and using synthetic processes (Haber and cyanamid) will be about 419,000 short tons of nitrogen. This figure is about three times the nitrogen content of the Chilean nitrate annually imported by Germany before the war. This great increase in the output of synthetic nitrogen in Germany was not accompanied by any substantial increase in the output of by-product ammonia from the coking of coal. In 1913 the output of by-product ammonia in Germany was equivalent to about 121,253 short tons of nitrogen. The output at the conclusion of the war is placed at not over 134,000 short tons.

A considerable fraction of the ammonia made by these processes was oxidized to nitric acid, which served as the indispensable raw material for the manufacture of explosives. Germany was cut off from imports of Chilean nitrate at the very beginning of the war, but is known to have captured a large supply estimated at 400,000 tons in Antwerp (equivalent to 62,000 tons fixed nitrogen). This large capture together with the existing stocks and plants kept the German explosive plants in operation until the new large nitrogen fixation plants referred to above were built. The Germans were able to build these extensions in time because successful plants were already in operation and every technical detail was known to them. New plants, therefore, could be erected at once, without delay for experimentation, and with assurance that when completed they would work satisfactorily.

In actual completed productive capacity and in detailed technical knowledge of how to design and operate plants according to the Haber process, Germany undoubtedly leads the world today.

Austria made an increase in her output of cyanamid but not sufficient to compensate for decreased imports from Chile. Her total output, as compared with the German output, was insignificant. Austria, Bulgaria, and Turkey evidently relied on Germany for their supplies of explosives.

Japan, Italy, France, and Great Britain

In the Allied countries there was not the same necessity as in Germany to erect nitrogen fixation plants, because supplies could be secured from Chile directly, or indirectly in the form of explosives made in America. Altho the first cyanamid plant was erected on Italian soil, the industry has developed comparatively slowly there. The output in Italy in 1913 was 16,515 short tons, rose to 27,673 tons in 1916 but fell to 16,535 tons in 1918.[1] Additional plants under construction are expected to bring the Italian production up to 88,000 tons per year. The production of cyanamid [1] in Japan rose from 7,716 short tons in 1913 to 55,000 tons in 1918. In addition Japan made a big gain in her output of ammonium sulphate [1] from coke ovens, 100,799 short tons in 1918 as compared with only 8,800 in 1913.

France suffered a decrease in output of by-product ammonia due to German invasion of much of her coal-producing territories. France had a cyanamid plant in successful operation at the outbreak of the war with an output of about 8,000 tons. By 1918 the French output had increased to 110,000 tons with additional plants

[1] Figures published by International Institute of Agriculture, Rome, Italy.

under construction sufficient to make a productive capacity of more than 300,000 tons.

The British supremacy of the sea made it unnecessary for Great Britain to undertake immediately a great building program for fixed nitrogen plants on a par with the German program. To be sure there was a serious danger to England in the submarine menace, but if the submarines succeeded in making a blockade of England effective, England was lost regardless of the supplies of nitrate. A policy of depending primarily on imports was therefore sound. England could and did take the time to investigate thoroly and to plan for the reconstruction period as well as for the war period.

A large technical committee known as the Nitrogen Products Committee, which was appointed by the Ministry of Munitions of War, undertook a comprehensive investigation of the whole subject from the economic, military, scientific, and technical standpoints. An Interim Report from this committee was submitted to the Minister of Munitions on February 22, 1917. A "Final Report" of this committee was made public in February, 1920, altho printed for confidential official distribution under date of May 10, 1919. This report is unquestionably the most thoro and reliable discussion of the economic and military aspects of the subject which has yet been published. Furthermore, much scientific and technical work was carried out under the direction of this committee, but the results of these experiments have not yet been made known in detail. The committee reached the conclusion[1] that both cyanamid and Haber plants could be operated with commercial success under the conditions likely to prevail in England after the war, and recommended in its

[1] See par. 638 of the Final Report referred to above.

Interim Report [1] the erection of both in England in accordance with detailed plans which it prepared. The Minister accepted the recommendation as to the erection of the Haber plant and the construction had been begun at the time of the signing of the Armistice, but had progressed little beyond the laying of foundations. It has since been transferred to the Brunner-Mond Company — the largest English chemical firm — and will be put into operation. The recommendation to erect a cyanamid plant was not accepted by the Minister because the construction of the large power plant needed would require from eighteen months to two years. The recommendation relating to the erection of a large cyanamid plant was, however, repeated by the Committee after the signing of the Armistice under date of May 10, 1919. So far as the writer is aware no action has been taken.

United States

The first attempt to operate the arc process on a commercial scale had been made at Niagara Falls in 1901, but proved a commercial failure on account of unsuitable design of the furnaces and was soon abandoned. This early American enterprise, however, aided the later development of the industry in Norway by showing clearly the nature of the technical difficulties to be overcome. Subsequently the process was introduced in North Carolina on European models but was soon abandoned, because it proved to be more profitable to sell the power for other purposes. A small plant using " off-peak " power has lately been put into operation near Tacoma, Washington.

At the beginning of the war the Bucher process was in its early experimental stages only.

[1] See par. 656 and pp. 140–142 of the Final Report referred to above.

In 1914 the cyanamid process was not actually in operation in the United States, but the plant of the American Cyanamid Company, one of the largest in the world, was located at Niagara Falls, Canada. Its personnel and capital were American, and its product was sold mainly in the United States.

The increased demand for nitrogen due to the outbreak of the war resulted in an increased output of the cyanamid in the Niagara Falls plant and also of coke-oven ammonia. Furthermore it stimulated experimental study of the subject. The General Chemical Company undertook extensive investigations of the synthetic ammonia process. The Bucher process emerged from the laboratory of Brown University and the large-scale experimental work needed for its development was undertaken by the Nitrogen Products Company, a corporation organized for the purpose. The Air Reduction Company also entered the field beginning the development of a process whose nature has been carefully guarded, but which is believed to be similar to the Bucher process in the basic chemical principles, altho considerably different in engineering design.

It was not until June 3, 1916 that any steps were taken by the government of the United States to encourage nitrogen fixation. The National Defense Act of 1916 made an appropriation of $20,000,000 to be expended by the President for the fixation of nitrogen for military and fertilizer purposes. A committee composed of leading American chemists and engineers was appointed to advise the President as to the best method of accomplishing this result. Dr. Charles L. Parsons of the Bureau of Mines, was sent to Europe by the War Department to study the subject. The cooperation of all American firms interested in the problem was secured. As a result of the report of this first

committee and of the report made by Dr. Parsons a new committee was appointed to consider and harmonize the two reports. This committee reached the conclusion that the Haber process is the one best suited to the industrial and economic conditions existing in the United States. At that time the Haber patents were still in effect in the United States. The General Chemical Company, which had been for some years investigating the synthesis of ammonia, believed that they had succeeded in developing a process which did not infringe on the Haber patents, but which was an improvement on the process. These conclusions were based on laboratory and semi-works experiments rather than on the successful operation of units of commercial size. The General Chemical Company offered to make the results of its investigations available to the government on generous terms and to coöperate in every way in the erection of a plant. The government was given detailed plans and specifications and the services of many technical experts without any charge, provided the product was used only by the government for military purposes; but a royalty of $5.00 per ton was to be paid on any fixed nitrogen sold commercially for fertilizer. The nitrate committee recommended that $4,000,000 out of the Congressional appropriation of $20,000,000 be used for the erection of a plant in accordance with the plans of the General Chemical Company. The plans also provided for the conversion of a part of the ammonia produced into nitric acid which was to be combined with the remaining ammonia to make the explosive ammonium nitrate. This recommendation was accepted by the War Department and on Oct. 15, 1917 the erection of Nitrate Plant No. 1 was begun near Sheffield, Alabama. This plant was planned to have a capacity of about 10,000 tons of ammonia equivalent to 8,500 tons of fixed nitrogen per year.

The Committee also recommended that steps should be taken to develop the Bucher process. The Nitrogen Products Company had been experimenting on a large scale with the Bucher process and offered to put its entire experience at the disposal of the government on the same terms as those offered by the General Chemical Company. The committee, however, reached the conclusion that tho the Bucher process is fundamentally sound, further experiments on details of design would be advisable before the erection of a large commercial factory would be justified. They therefore recommended that $200,000 should be made available for further experiments on this process under the direction of the War Department.

The entry of the United States into the war radically changed the situation. The demands for explosives were enormously increased, and the alarming success of the German submarines during 1917 made dependence on Chile for nitrates increasingly dangerous. The possibility had to be faced that the German submarines would secure virtual command of the sea. In such a contingency England must inevitably acknowledge defeat. But the United States, altho denied a definite victory, could at least avoid defeat through invasion as long as the supply of explosives did not cease for lack of nitrates. With an adequate supply of nitrates available from the air, the United States and Canada together could defend themselves against invasion indefinitely even if completely shut off from imports by sea. No other imported article is really essential for the national existence and defense.

It was, therefore, sound public policy to take steps to ensure an adequate supply of nitrates from sources beyond the reach of the submarine. The nitrate program of the War Department was enormously increased.

Certainty of production at an early date became the paramount consideration, and comparative cost and probable competitive strength after the war were of minor importance.

The cyanamid process was in successful large scale operation at Niagara Falls, Canada, and the technical knowledge of the staff of this plant was available to the government of the United States. A cyanamid plant could consequently be erected with assurance that when completed it would function properly without long delays to correct mistakes in design almost inevitable when the design is based solely on small scale experiments.

Altho no large scale plant for the conversion of ammonia into nitric acid was in operation in the United States, much experimental work on the process had been carried out by the American Cyanamid Company, and by the Bureau of Mines in coöperation with the Semet-Solvay Company. These experiments had been sufficiently successful to justify reliance on this method in connection with the Haber and cyanamid processes in preference to the arc process, which was excluded on account of its enormous power requirements. Accordingly Nitrate Plant No. 2 was started near the Muscle Shoals on the Tennessee River near Sheffield, Alabama. It was designed to produce 220,000 tons of calcium cyanamid equivalent to 41,500 tons of fixed nitrogen annually. It is expected ultimately to use water power from Muscle Shoals, but since at least three years will be required to build the dams and power houses a steam power plant was erected to furnish the power needed at once.

Before the construction of Plant No. 2 had proceeded very far, the program was again increased and orders given for the construction of Plant No. 3 near Toledo and Plant No. 4 near Cincinnati.

Furthermore, at the direct request of the French government, a plant to produce ten tons of sodium cyanide per day by the Bucher process was erected at Saltville, Virginia, by the Bureau of Mines, acting as the agent of the War Department. The French government desired to use this material for the manufacture of poison gases.

At the date of the signing of the Armistice, Plants No. 1 and 2 were in operation in part, altho all the units were not yet completed, and the cyanide plant at Saltville, Virginia, was also in operation. Plants No. 3 and 4 had advanced only a little beyond the preliminary work of clearing the land and laying foundations. Further work on No. 3 and No. 4 was stopped, and these plants have been abandoned.

Plant No. 1, which was to produce synthetic ammonia, however, was not completely successful. Mistakes were made in the design so that the completed plant did not operate in an entirely satisfactory way. This is not surprising since the designs were based on experiments on a much smaller size, and no one in America had any experience in the operation of a large size commercial plant. Ordinary business prudence, which requires that every detail of design should be perfected through construction, operation, and modification of a single large size unit before the construction of a large plant of many units, was deliberately neglected in this case on account of the urgent necessity for speed. Much of the construction is of good usable quality, including railroad connections, the village for workmen, power plant, repair shops, offices, factory buildings, and a large part of the special manufacturing equipment. Some of the special equipment for the process will have to be redesigned and rebuilt. The titles to the patents on the Haber process have been seized by the Alien

Property Custodian and, therefore, the need of avoiding infringement will no longer hamper the reconstruction of the plant. There can be little doubt that it can be put in good working condition by the expenditure of a small fraction of the original cost. The cyanamid plant (Nitrate Plant No. 2) is of good design and in good working order, the design having been prepared by engineers experienced in the operation of a successful large plant.

The cyanide plant at Saltville, Virginia, was ready for operation a few days before the signing of the Armistice and some units were put into operation and yielded cyanide. But, as a result of the cessation of war needs, no attempt was made to secure capacity output, and after a short trial operation the plant was shut down. Altho it was undoubtedly an important advance in the art of making cyanides, further improvements in design, especially in the furnaces, may be necessary before the process will prove commercially successful in normal times.

V. The Future Policy of the United States

All the nitrogen fixation plants were closed down soon after the Armistice, because the appropriations under which they were built provided that they were intended to produce war materials, and the War Department did not feel authorized under the law to operate them for the manufacture of fertilizer for sale to the public. The War Department has, however, organized a large research laboratory, under the direction of Professor Lamb of Harvard, for the purpose of studying and experimenting on the technical problems involved in the design and operation of these plants in the expectation that Congress will authorize their permanent operation for supplying fertilizer in peace and munitions in war.

The large capital investment has now been lying idle for more than a year. No fertilizer has been produced. Before production can begin it is necessary for Congress to determine a permanent policy and to pass the necessary legislation. There are several alternatives. (*a*) The plants might be operated by the government for the production and sale of fertilizer in times of peace; being then available for munitions if ever again needed. (*b*) They might be sold to private corporations under such conditions as would ensure operation. (*c*) The operation of the plants might be abandoned and the plants dismantled either directly by the government or by sale for the price of junk to private concerns, who would dismantle them or convert them into other uses.

Whatever is done with them the government must assume a considerable loss on the cost of the plants. They were built during the period of the war under a cost plus contract, and with every emphasis on speed rather than economy. There was much extra cost through payments for overtime labor and through premiums for prompt delivery of materials. A considerable fraction of expense must therefore be charged off as a part of the cost of the war, and the plants written down at least to the cost of reproducing them at the present time with all engineering mistakes eliminated. The cyanide plant at Saltville has already been offered for sale by the War Department.

Senator Wadsworth has introduced a bill (S. 3390), which provides for the operation of these plants by a quasi-public corporation to be known as the United States Fixed Nitrogen Corporation. The government is to turn over Nitrate Plants No. 1 and No. 2 and the Muscle Shoals Power Plant, now under construction, and to supply a working capital of $12,500,000 (or so much thereof as may be needed), and in return receive

the entire capital stock of the corporation. The directors of the corporation are to be appointed by the Secretary of War, who shall be ex-officio Chairman of the Board of Directors. The plan would place the corporation under ordinary commercial law and free it from the usual government red tape in managing its finances and personnel. It is understood to have the support of the Army and the Navy Departments. No action has yet been taken (May 1, 1920) by Congress, but a committee of the Senate has been holding public hearings on the bill referred to above. During these hearings Secretary of War Baker, General Williams, Chief of Ordnance, and other officers of the War Department urged government operations of the plants in accordance with the plan of the Wadsworth bill. It was pointed out that the operation of these plants would reduce the need for a reserve supply of nitrate such as is now held by the War Department for emergencies, and that the working capital required could be secured by the sale of one half of this emergency supply; hence no additional appropriation from the Treasury would be required to put the plan into effect. On the other hand, F. S. Washburn, President of the American Cyanamid Company argued against the operation of these plants by the government. The Committee on Expenditures in the War Department of the House of Representatives has also taken much testimony dealing with the construction and future disposition of these plants.

A discussion of the pros and cons of private and government operation of manufacturing enterprises is beyond the scope of this article. The important question is whether the plants are to be operated or dismantled. To allow them to stand idle is nearly equivalent to dismantling them, because they would rapidly deteriorate. Without an experienced operating staff and the constant

improvements which come with operating experience they would be of little use in an emergency. If they can earn interest on any figure above their sale price as junk, it will be profitable for the government from a purely financial point of view to have them operated. Moreover, if operated, they will be an important military asset and, if the need ever arises, will ensure that the United States can make itself independent of imports of nitrate from Chile, just as Germany did. Should this need never arise, these plants will continue to furnish a large supply of nitrogenous fertilizers, and thus increase the food supply. There can be no danger of excessive supplies of fertilizer material. There is plenty of land to put it on which has never received a pound of commercial fertilizer. In some way, and soon, the existing legal obstacles to the operation of the plants should be removed, in order that they may forthwith contribute to the production of food for a starving world.

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PRICES AND CURRENCY IN JAPAN

SUMMARY

Rise of prices and wages, 433. — Synchronism with changes in the United States, 434. — Currency inflation and prices keep step, 434. — Government borrowing no cause of currency expansion, 435. — Bank notes expanded but deemed secure, 437. — Rise of interest rate, 439. — Rising market expected to continue, 441. — Criticisms and forebodings, 442.

DURING the war and the Armistice Japan passed through much the same economic experience as other manufacturing and maritime nations. There was an initial depression after hostilities broke out, followed by nearly four years of rapid manufacturing growth, intense industrial and commercial activity, high profits, speculative promotion, and inflation. Then with the Armistice came a sharp but temporary reaction. Prices fell abruptly for a brief period, then began to recover. Soon business was again in full swing, more confident if possible than ever. For while the war was raging every peace rumor depressed the market. Now that peace has come nothing visible intervenes between the castle tops — no matter how lofty — of any promoter's dreamland and the blue sky above.

This deviation from customary conditions has progressed of late with accelerated velocity. Prices rose gradually but steadily during the first half of the war, then suddenly spiraled upward. Wages lagged behind until after the Armistice, then they spurted after prices with a speed that would soon have overtaken anything less agile and aspiring.

Down to the end of 1916 the relation of wages to prices remained about normal. Since 1900 or there-

abouts the standard of living in Japan had been rising faster than the cost of living. At the end of 1913 wages were 46 per cent higher and prices were 33 per cent higher than they had been at the opening of the century. Two years later wages were 49 per cent and prices were only 30 per cent above the figures in 1900. For a year longer wages continued to increase faster than prices; then the condition was suddenly reversed. By the close of 1917 the rise in wages since 1900 had become 105 per cent while that in prices had reached 154 per cent; and at the end of the war the two were respectively 157 and 195 per cent above their level eighteen years before. In spite of a permanent decline after the Armistice in the cost of some commodities, such as pig iron and heavy chemicals, the price index had risen to about 240 per cent above that of 1900 by the end of September, 1919, or more rapidly since hostilities ceased than at any time during their continuance. The recent increase has been especially marked in case of food — rice having quadrupled in price in less than two years.[1]

[1] The following percentage tables showing price movements for commodities and cost of living respectively are compiled from different sources. For Japan they are from the Oriental Economist and the Bank of Japan; for Great Britain from the Statist; for the United States from Bradstreets. The base dates are different.

Date	Commodity prices			Date	Cost of living (as collated by the firm of Mitsui Bussan Kaisha)		
	Great Britain	United States	Japan		London	New York	Tokyo
1913	100.0	100.0	100.0	June, 1914	100.0	100.0	100.0
1914	100.0	98.7	95.5	Dec., 1914	109.8	105.0	98.3
1915	127.1	107.0	96.7	Dec., 1915	142.6	126.1	138.8
1916	160.0	120.3	117.2	Dec., 1916	192.5	158.6	156.6
1917	205.9	170.0	148.5	Dec., 1917	229.3	207.5	194.3
1918	227.1	203.2	195.9	Dec., 1918	236.3	214.3	238.7
Jan., 1919	224.4	206.3	214.2	Jan., 1919	237.4	206.9	234.8
Feb., 1919	220.6	191.5	213.0	Feb., 1919	235.3	198.6	227.0
Mar., 1919	217.3	187.1	206.3	Mar., 1919	232.3	202.6	223.6
April, 1919	217.2	187.7	206.6	April, 1919	234.7	202.0	227.8
May, 1919	228.9	187.2	214.6	May, 1919	243.3	210.7	244.3
June, 1919	235.0	196.5	228.1	June, 1919	229.4	211.1	256.1
July, 1919	242.8	205.2	247.2				
Aug., 1919	250.2	217.2	251.0				
Sept., 1919	252.7	211.5	257.0				
Oct., 1919	264.0	211.9	271.0				

This has naturally stimulated the upward movement of wages. But an exact measurement of the latter is difficult, because it has been accompanied in many establishments by a reduction in the hours of work, with a corresponding addition to overtime earnings. During the single month of July, 1919, increases of 30 per cent were made in several important industries; and tho the wage level is generally believed to be lower even now as compared with the price level than it was at the outbreak of the war, the recent tendency has been toward restoring their traditional relation.

Leaving now the comparison of prices and wages, two other interesting parallels appear. The rise of prices by groups and by individual commodities — especially raw materials and important classes of manufactures — has followed closely that in the United States. The word "followed" is used advisedly; for the initiative seems to come from our side of the Pacific. Synchronism of price movements in America and Japan is much more striking than in Europe and Japan.[1]

In the second place prices and currency inflation have kept step with each other with the same rhythmic precision as in our own country and beyond the Atlantic. Until the end of 1916 (which it will be recalled was the dividing line between normally ascending prices and the abrupt skyrocketing that ensued) the quantity of coin and bank notes in circulation remained at about the prewar level. In 1915 it fell to the lowest point since 1912, Yen 493,000,000; and it rose less than 10 per cent between 1912 and the middle of 1916. Then a change occurred as marked as in case of prices. Within two years of the latter date the volume of currency practically doubled. This monetary deluge, consisting almost

[1] According to compilations and charts of the U. S. Bureau of Foreign and Domestic Commerce.

entirely of paper, had by no means reached its crest when the war ended. In fact Japan added to its currency during the first fiscal year of the Armistice a sum in bank notes alone nearly equal to all the bank notes in circulation two years before. Japan's paper money has more than quadrupled during the past four years and at last reports was still increasing. The proportion of coin in circulation has fallen from 35 per cent to 15 per cent during that period.

This paper expansion is not caused by government borrowing. The public debt of Japan has increased but Yen 672,000,000 since the beginning of the war, and a major part of this increment is represented by home owned treasury bills. Nor has the ratio of specie reserve to bank notes declined. It was about 65 per cent when the war began and 66 per cent when the war ended. In this respect the expansion of currency has been largely what we have recently learned to call " gold inflation." This specie consists mostly of war earnings and profits belonging to its customers, to whom the Bank of Japan or associated banks has issued bank notes or credits in return for their gold credits in foreign countries, especially Great Britain and the United States. The gold could not be collected in kind during the war on account of the embargo upon its export laid by those governments. However during the period of hostilities much bullion was brought to Japan from South America, and since the Armistice considerable gold has come from the United States. So the quantity of precious metals physically present in Japan is much larger than when the war began. But it is not in actual circulation, the government having been forced to issue fractional paper currency to take the place even of the small silver coins formerly in universal use. At the end of October, 1919, the government and the Bank of Japan together held

Yen 1,899,000,000 of specie, of which Yen 1,354,000,000 was still deposited abroad. The bank is severely criticized at home for counting its foreign specie holdings as part of its note reserve and issuing paper money against this security.

But over and above the bank notes that are accounted for by specie reserves held in Japan and elsewhere there remains a sum in paper money exceeding by several million yen the total bank note circulation of the Empire the last year of peace. How is this accounted for?

Under the law the Bank of Japan, which is the only bank of issue in the archipelago proper, may emit up to 120 million yen of notes, secured by government or private securities or commercial bills, which are either tax free or in some contingencies subject to a light impost. It may issue notes secured by the same kinds of paper over and above 120 millions to any amount to which the minister of finance may consent, by paying a tax of not less than 5 per cent upon their par value. When business is booming and profits are high, borrowers upon securities and commercial bills are willing to pay enough for bank accommodation to justify the bank in paying 5 per cent tax upon an excess note issue, in order that it may loan to such customers. If the bank shows a disposition to increase its circulation unwisely, the government can use either a direct veto or an increased tax in order to discourage further note expansion. Everything naturally depends upon the conservatism of the bank authorities and the discretion of public officials. Before the war there were seldom bank notes upon which the 5 per cent tax was paid, because the excess above those secured by specie and bullion was normally less than 120 million yen. By the end of 1919 the quantity of 5 per cent taxed notes outstanding was more than four times the maximum quan-

tity of untaxed and low taxed notes authorized by law which was also in circulation. The effect of the war is shown by the following table giving the note circulation and loans of the Bank of Japan at the close of each calendar year in the nearest million yen:

Year	Note circulation	Specie reserve Yen 1,000,000	Taxed notes	Loans
1914	385	218	47	87
1915	430	248	61	58
1916	601	410	70	188
1917	832	649	63	170
1918	1152	721	310	627
1919	1564	951	492	723

Presumably the security behind those additional notes not covered by specie reserve was not quite so conservatively selected as before November, 1917, when a government order made the Bank of Japan extend the list of collateral securities for loans, "in order to facilitate the financing of trade and industries at home." Moreover most private securities in Japan have advanced tremendously in nominal value during the war, and many of them represent capitalization based upon the war cost of factories, machinery, and ships, and upon war profits. Since October, 1917, the government has issued Yen 115,000,000 in the fractional paper currency already mentioned, to take the place of coins which disappeared from circulation. This currency is a direct obligation of the state, and has no relation to the bank notes just described; but it likewise contributes to the present inflation.

Nevertheless, no one doubts the security behind these notes. Like our federal reserve notes they are backed ultimately by the government. Japan's financial and currency condition is not comparable with that of France, Italy, or even Great Britain. Indeed from a bookkeeping point of view it is sounder than our own;

since Japan's specie reserve is relatively larger than ours. But while our currency increased some 50 per cent during the war, that of Japan increased 180 per cent.

Consequently the cost of living is outdistancing average income, and the people are profoundly discontented. They attribute their ills in the main to inflation. They refuse to regard the rise of prices and the unsettlement of wages as necessarily worldwide phenomena, and insist on finding local causes for these evils. Perhaps their proximity to China, where business continues placidly without such radical displacements, encourages this opinion. The Japanese say that "hard money" China proves their contention.

Moreover in Japan, as in the United States, an uneasy memory lingers of the currency ills of a former generation. At a time when that country's commerce and manufactures were still in their infancy it had a period of inflation, following the Saigo rebellion in 1877. Great quantities of non-convertible notes were issued at this time, with the result that the prices of commodities went soaring. Prices reached a maximum in 1878 and business did not recover a stable basis till six years later.

Today's demand that the government exert itself vigorously to reduce the currency comes from almost every quarter except the country gentry, who are profiting exceedingly by the high price of rice. Commercial bodies, bankers, and even the House of Peers have felt called upon to make representations to the cabinet, if not specifically recommending a curtailment of the money supply, at least urging the authorities to deal radically with high prices. As in this country there is a variety of counsels. Even the ministry is reported to be divided as to policies, and a political complexion is given purely economic measures. According to a leading

daily: "The Minister of Finance has peculiar ideas regarding economics. An inflation of the currency according to him is not a cause but an effect of the advance in prices; currency is wealth, and we should not deplore but congratulate ourselves on an increase of paper money and credit." Another prominent journal characterizes the minister's views as "intolerably indiscreet and irresponsible." A third newspaper of wide circulation and authority believes that even were the minister's views correct, and were a policy of deflation to check the present intense business activity, nevertheless such measures are required. "If the currency is reduced we may expect perhaps a financial depression to follow; but this is no cause for alarm. The fact is that the present prosperity is but empty inflation, unnatural and unhealthy. A great reaction is sure to come some day. It is better to reduce the magnitude of this reaction by taking timely measures to check inflation before it arrives." Such opinions seem to represent the sound business opinion of the country.

Still the authorities are moving very slowly. Bank rates have been advanced and a domestic loan was issued to absorb money in excess of real business needs and thus prevent unhealthy speculation. But the fact that these short term exchequer bonds bear interest netting the purchaser 6.77 per cent, and that subscriptions even at this rate were unsatisfactory, indicates that inflation does not always make money plentiful. Indeed a sensible stringency has prevailed recently in the Japanese money market. The thirst for currency seems to grow with indulgence. By multiplying the tokens of wealth the government increases the demand for them.

Of course we must not overlook the fact that the leaven in this mass of ferment is the world's want of goods and Japan's ability to earn high profits making and market-

ing these goods. But by unsettling the relation between physical property and its monetary measure the authorities have added to the gambling element in business. Those who can command capital or credit bet that goods will continue to rise and that money will continue to depreciate; and so long as they are winning there is no limit to their demand for money to raise their wagers. This call for money is over and above another concurrent demand — more legitimate than that of the speculating profiteers but also in turn highly speculative — for money to increase the machinery of production, to build factories and ships. So multiplying the supply of money may simultaneously lower its value and raise the price paid for using it; depreciation and rising interest go hand in hand.

The disposition to bet on the continuance of a rising market — a market rising partly on account of inflation — is not confined to goods that pass into direct consumption. Perhaps one should say, not "bet," but buy titles to goods; for in many cases no physical supplies are held by either seller or buyer. Not only do speculators hold rice, sugar, cotton yarn, and raw silk for higher prices, but they inflate the capital of productive enterprises upon the assumption of continuously rising markets. A shipping firm with a moderate investment in one or two ships will mortgage those ships on the strength of high charter rates in order to buy equities in additional vessels. As charter prices continue upward the increased earning power of these vessels — which leads in turn to increased bidding for new construction and growing cost per ton — is capitalized and additional money is borrowed upon this security to buy equities in more ships. Buoyed up by these vessels, like the cloud of canvas that used to tower above an old time Yankee clipper, floats a lofty and unstable superstructure of

more or less imaginary capital, far less substantial than the clipper's canvas — for it is made of paper. First of all there is the increased capitalization of the shipping company — always tending to expand in proportion to the volume of business the company controls; then come the securities that have been marketed by the company, the mortgages which it has given on its property in order to buy new equities; and last of all, perhaps, we have circulating through the community bank notes issued against these securities. So the nominal capital invested in the shipping business grows faster than actual tonnage, or even than its value expressed in inflated prices. The old Japanese steamship lines finance their extensions from their immense reserves, and have not participated in the practice just described. Neither have conservative and long established manufacturers. But inflation has encouraged a mushroom growth of new companies for whom expanding currency and rising prices are a necessary condition of existence.

So the thirst for paper money — or for more money — grows with its gratification. Some men in Japan, like the Minister of Finance, believe that multiplying these tokens of wealth assists to increase real wealth — that this flood of bank notes actually turns the wheels of factories and bears to market the cargoes they produce. His opponents believe that the supply of currency should follow and not anticipate the expansion of production, and that for the amount of money in a country rapidly to outstrip the country's ability to produce goods is a form of hypertrophy as dangerous to the economic organism as an analogous maladjustment would be to the physical organism. They cite the following existing conditions in Japan as signs of such an unhealthy development:

1. An increasing concentration of wealth in the hands of speculators, landlords, and industrial capitalists, be-

cause prices have risen faster than wages, salaries, and other incomes from service. Company dividends of 50 to 70 per cent are not uncommon, and average profits are abnormally high. The increase of great fortunes during and since the war is a matter of common knowledge. This shifting of wealth into the coffers of a few firms and individuals is much more of a subject for neighborhood comment and criticism in a small and homogeneous country like Japan than in a large country like the United States.

2. An epidemic of gambling in staple commodities which is harmful to the general public. "With little or no decrease in production, cotton yarn has doubled in price within a year." "There are sufficient supplies of rice, while a bumper crop is promised for the next harvest. Yet the price of rice continues to soar, intensifying the feeling of unrest among the people. This is chiefly due to the machinations of speculators and the hoarding of wealthy farmers. These practices are facilitated by the unnatural inflation of the currency." "The inflation of the currency and the unrestricted speculative fever are among the chief factors in forcing up prices. There is now a most marked sign of intense speculation — with the demand for provisions as its nucleus — in towns and rural regions alike. . . . Cotton yarn and cloth, sugar and wheat are equally objects of profiteering. It even happens that transactions exceed production by several times, thus absolutely ignoring the interests of the consuming public." Such press opinions might be quoted indefinitely.

3. Speculative promotion and capital inflation. In October, 1919, according to the Hypothetic Bank, the average paid up capital per share of the stocks dealt upon the Tokyo exchange was Yen 58.49, while the average quotation per share was Yen 250.20. Average

dividends were 20.77 per cent per annum. Many of these shares represent stock dividends issued to capitalize war earnings or war earning capacity; while others are new issues by companies still in the initial stages of development. To quote a typical press comment, that might apply to almost any recent period, "promotion boomed again during October, and the effect of inflation was displayed to the fullest effect." The total of funds called into use for that month was Yen 562,365,000. During the same month 323 new stock companies were floated, and 81 were enlarged. In the course of the war the cotton machinery of Japan increased less than 20 per cent, but the paid up capital invested in that industry increased 60 per cent. Yet cotton spinning is one of the highly centralized and conservatively managed industries of Japan. In many branches of manufacture it is safe to assume that capitalization has multiplied from five to tenfold as rapidly as the physical plant upon which it is ultimately based. According to an estimate made by the Bank of Japan the increase of capitalization in Japan during the war was about $2,340,000,000, as compared with $600,000,000 for an equal period under pre-war conditions. Since the Armistice the growth of capitalization has been even more rapid than it was during hostilities. In the course of 1919 it was Yen 4,301,539,000, or Yen 1,121,530,000 more than in 1918, which had broken all previous records. The increase in stocks and bonds has followed about the same curve as the expansion of currency and the rise of prices. Investment has turned from manufacturing toward commerce and banking — tho by no means deserting the former field — because it is difficult to procure machinery for equipping factories while it is relatively easy to find immediate productive employment for money in trading and finance.

So we have a whole constellation of economic phenomena — prices, wages, currency inflation, commodity speculation, and investment growth — moving almost in the same orbit. Moreover that orbit is aberrant from the normal orbits we have been accustomed to observe. The great convulsion of the war is the proximate and obvious cause of this common aberration. But the economist will not rest content without a closer study of the method by which the cause has produced its successive effects upon each of these elements in our economic life, and the order in which this effect has been transmitted from the one to the other. Is currency inflation the stone that precipitated the avalanche? Japan affords a laboratory experiment which suggests, at least, that a nation's monetary system is one of the first points in the body economic that the disease of war attacks, and that from this base it speads its toxins throughout the remainder of the business and social organism.

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FACTORS DETERMINING THE INTEREST RATE

SUMMARY

Introduction. Factors to be considered, 445. — I. Time preference in a static society, 447. — The effect of invention on the interest rate, 447. — Economic expansion caused by invention, 449. — Time preference and a constructive attitude, 450. — The "price" of capital supply, 451. — II. The mechanism of finance, 454. — The interaction of gold and price levels, 455. — The effect of credit inflation, 455. — Discount and interest, 458. — Recent inflation, 459. — Conclusion, 461.

By way of apology for presuming to discuss a subject as venerable as that of interest, it may be urged that recent financial experiences have thrown a new burden of proof upon established doctrines. Not only the immediate determination of a market rate, but the relation of the rate to bank discount and to inflated price levels, has assumed a new importance. This paper does not attempt, however, anything so ambitious as a reforming of theories: in a general way the Austrian psychological concept is assumed as a foundation. The purpose is, rather, to attempt to show the correlations of the major factors determining the interest rate.[1]

The discussion will be confined, in the main, to pure interest — the net payment to capital as such — which constitutes the substance of the actual rates appearing

[1] These correlations as they appear in the business cycle are susceptible of mathematical expression, but such a refinement of method was not thought necessary in connection with this paper. The correlations that could be so stated are entirely obvious from an inspection of business data, and are not in dispute. They may be seen, for example, in the Brookmire Barometer Charts, the Babson Reports, or less conveniently in the financial diagrams published by the National Monetary Commission. A very complete study appears in The Review of Economic Statistics, January and April, 1919.

in the market.[1] It is, of course, assumed that a variable premium for risk is usually present, with which may be included a premium or discount for anticipated changes in the price level. The charge for placing an investment — an item which has so much to do with the inequalities of rates as between urban and frontier regions — will be taken for granted. Other lesser influences will also be slighted, and attention will be centered upon the following: First, the so-called "time-preference" rate — the psychological attitude toward securities as contrasted with more immediate goods.[2] Second, the marginal investment rate, by which is meant the productive results in terms of interest arising from newly applied inventions, and other expansions of properties. Third, the bank discount rate — the usual control of currency inflation. Fourth, the actual price level — the ratios at which commodities exchange for gold as measured by adequate index numbers. Fifth, the theoretical price level, or that level which, under the conditions of the market then obtaining, would be necessary to maintain in equilibrium a gold monetary reserve. These factors may be summarized as saving, investment, inflation, and prices. It is assumed that these are the vital forces involved in the determination of the interest rate.

I

The force of time-preference may be seen most easily if we assume the case of an entirely static society. In such a society landed properties on which interest incomes are based will be held firmly in hereditary pos-

[1] Interest is here used to cover all incomes that may be considered as belonging to actual or potential investment in negotiable property, from real estate to personal notes. It therefore includes that portion of an enterpriser's profit which in strict accounting should be entered as interest on his holdings. It even includes wage surpluses when they have been definitely pledged. Bank discount is, of course, a form of interest, but it may be contrasted with other forms because of its relation to deposit currency.

[2] F. A. Fetter, Economic Principles, Pt. IV.

session, but they will be mortgaged and sometimes alienated by spendthrift or unfortunate families. The market rate will be determined as a resultant of the opposed consuming and saving propensities. A low rate will therefore be indicative of effective thrift, and of a low relative valuation placed upon immediate consumption as compared with future incomes. Exceptions might be noted in such a case as the spending of capital on scientific research, but this would imply a transition to a dynamic condition.

While time preference is always present as doubtless the most fundamental factor in the determination of the interest rate, yet the antithetical effect of dynamic conditions must be given much weight, particularly in modern times. Since the theoretical question involved is one over which there has been much dispute, it may be well to introduce the matter with a precise illustration.

Let us suppose that in a system otherwise static, there appears a markedly efficient invention calling for the installation of a new type of factory machine. Shares are issued representing the expected increase in property values, and are sold to secure the needed capital. These shares constitute an addition to the income-bearing properties already on the market. Unless there develops an abnormal impulse toward saving, the interest rate therefore rises, expressing the lower valuation placed upon the increasing properties. The case is simply that of increasing supply and lowering price, the rate being the reciprocal of the valuation of properties of estimated income-bearing power.

The anticipated earnings will next be tested by the actual productive power of the machine. To make the case extremely simple, let us suppose that the machine is made of the same materials that would have gone into

the direct goods displaced by the saving. Aside from a small degree of friction involved in transferring capital and labor to the new channel of demand, the market would be scarcely disturbed up to the time when the new machines came into operation. Then a readjustment would occur, out of which the businesses using the new machines would show a certain volume of new interest income above all costs of upkeep. This income, compared with the cost of the machines, would constitute a temporary productivity rate. A certain quantity of present goods would have been actually converted into a definite continuous income. It is to be observed that the materials and services used in making the machines are not valued primarily in terms of their capitalization, but in terms of their alternate use as direct goods. When the materials saved are of a different sort from those invested in machines there would be some readjustment of values, but the principle would hold. The cost of the machines would be alternate and equal to the cost of direct goods given up, and on this cost the temporary productivity rate would be based. If the rate proved to be high, there would be an active bidding for more capital to install more of the machines. This process would go on, with a high interest rate meanwhile ruling, until increasing costs of production and decreasing prices of output brought the earnings on the last increment of capital down to the current market rate. If no further inventions occurred both the interest rate and the average wage, which would have been bid up by the activity of enterprisers, would at length subside to approximately the old levels.[1]

[1] Some inventions are simplifications of apparatus and may decrease the volume of equipment. Yet there still remains an investment cost from which a temporary productivity rate might be computed. When the saving is effected entirely through changes in the method of work, a question of wages rather than interest is involved. But the relation between the wealth income and the labor income is very close. In a final sense, all income is really both, arising from the interaction of man and nature. The use of machinery is simply a change in the mode of laboring. The ascribing of income to subjective

Modern societies are highly dynamic, both from the standpoint of intensive inventional progress and extensive growth by foreign trade and investment. Hence the influence of business enterprise on the interest rate assumes an importance second only to that of time preference. Dynamic conditions arise primarily from the growth of mentality, accompanied as it usually is with a changing social attitude and habits of industry and thrift. Applied science is, then, the cutting edge of progress. As science becomes embodied in machinery, it tends to raise the interest rate; but a completion of the impulse of growth is likely to be marked by low interest again, unless habits of thrift have decayed. When an area thus highly developed comes into trade and investment relations with a more backward but potentially rich community it experiences a reflex of further growth, affecting favorably the earnings of both capital and labor. Hence a well developed area, like England for example, becomes the center of a progressive wave of dynamic growth, marked at the growing frontier by high interest rates, and in the older center by low interest rates. National systems of this sort, clashing in undeveloped areas, are likely to give rise to imperialisms.[1]

One or two points of criticism of current ideas about interest remain to be noted at this stage of the discussion. The first of these is the common tendency to confuse time preference with a more fundamental constructive and sacrificing attitude toward future incomes. The

or objective causes arises from comparison, expressing the relative amounts which under given conditions differing units of labor may produce, or the relative amounts of production of similar labor with different agents of production. With static conditions and diffusion of knowledge, surplus income tends to inhere principally in landed properties, through the leveling effects of competition and the pressure of population. But it may inhere also in individual knowledge and skill. While wealth incomes are the ones usually capitalised and sold, labor power is susceptible of hypothecation, and loans are sometimes made on its security alone.

[1] The writer has attempted to sketch the historic workings of this economic tendency in a recent number of the National Social Science Series, entitled National Evolution.

time preference with which interest theory is concerned is an individual choice, which appears in the market principally as a demand for equities in property. The interest rate which is evolved reveals little about the real attitude toward the future. Thrift, in the negative sense of saving, tends toward the production of a low rate, while the constructive ability which produces useful inventions tends immediately toward a high rate. Yet both are aspects of the same forward-looking attitude.

It hardly needs to be pointed out that the inadequacy of the interest rate as a measure of a forward-looking attitude lies in the fact that a negative rate is impossible as a market condition, while a lower valuation of the present as compared with the future is quite possible as a psychological fact. The impossibility of a general negative rate arises primarily from the fact that the capacity for saving is always limited to a somewhat narrow margin of luxury spending. It is evident that the substance of present spending — all that could be properly included in real cost of living and in upkeep of properties — is as much or more a measure of future valuations as of present, and so could not be affected by a lessened time preference. Also, as to the value of capital properties, while it is true that the cost of machines and other equipment of indirect goods cannot rise markedly above the level of direct goods of equivalent materials and elaboration, yet the land which forms the basis of all productive properties may be bid up to any level that intensive saving may make possible. But capitalization would have to be driven up to infinity before even a zero interest rate could be produced. Hence, as between a limited saving capacity and an unlimited possibility for capitalization, a negative interest rate becomes impossible. Of course a negative rate in the sense of occasional losses may sporadically appear.

But, on the other hand, a psychological attitude of subordination of present to future may undoubtedly rule. The general attitude in progressive frontier communities is commonly that of entire absorption in the future, for which every sacrifice will be endured. If the interest rate were in a fundamental sense a measure of the preference of present over future, then a negative interest rate would prevail. But since the absorption in the future expresses itself in the production and purchase of all available equipment for the growing properties, a high preference for present goods appears to be reflected in the market interest rate. The rate in such a case is evidently a result of the earnings of dynamic investment, as already discussed. Later, when static conditions rule and luxury spending has perhaps begun to appear, the interest rate may again be low. If the society becomes decadent, interest may again be high, as in the period of maximum progress.

A question may also be raised as to the advisability of designating the interest rate as the " price " of capital loans. The term is appropriate in the case of bank credit but much less so in the case of saving and investment. To begin with, capital in the concrete is a relatively permanent investment, however much it may assume the shape of loans to individual investors who are shifting their capital. It therefore seems more logical with respect to the bulk of investment to apply the term " price " to the reciprocal of the interest rate — the " year's purchase," as it is expressed in England. From this point of view investment is the purchase of incomes, or perpetual annuities, as in general they may be termed. The interest rate is the reciprocal of the figure at which such a unit annuity sells, e. g., a five per cent rate means that a dollar income costs twenty dollars. This inversion of the term " price " in connection with capital may

seem a mere technicality, inasmuch as either side of a trade may theoretically be considered as price, and in this case both sides are expressed in terms of money. But a useful application may appear when the ordinary supply curve for capital loans is redrawn as a demand curve for annuities. It will then be seen that a somewhat inelastic curve may indicate a falling off of the volume of capital supplied (rectangle of coördinates) as the price falls; that is, as the rate rises. That such might be the case has often been suggested from a consideration of the fact that high interest calls for less saving in the attainment of a given income; yet on the contrary it has been held to conflict with the usual law of supply and demand. To be sure, the facts cannot be determined *a priori;* perhaps the curve of annuity demand is very elastic. But at least the method of statement here suggested avoids the theoretical assumption that high interest must necessarily mean correspondingly increasing volumes of immediate capital supply. And we may now reduce our statement of the interest rate to the formula that it is the reciprocal of the price of annuities — a price which fluctuates with the supply, as increased by business enterprise, and the demand, as determined by the practice of saving.

Viewing industrial society as an organization for producing goods and annuities — the latter being relatively perpetual and inheritable — serves to set forth the more fundamental nature of interest. The major portion of the interest income may be described as the surplus output from more productive or better situated agents of production — principally equipped real estate — above the labor and material costs of production.[1] Normally,

[1] Ordinary commercial borrowing may seem to be outside the range of this statement. Yet it may be considered as a temporary investment in the exchange phase of production, or as a renting of gold and its credit representatives. Borrowing against labor incomes is still less tangible. But in every case a present claim upon income is exchanged for a future claim, the basis of which is a durative agent or agents of production.

the amount of capital improvement is such as to equalize the interest rate at the margin of investment — the earnings of contemplated further improvements as already discussed — and to give a similarly uniform wage within each grade of labor. Interest is, then, typically a generalized expression for rent, and is inherent in the productive process and in the physical variations of land. The communist advocacy of its abolition is therefore somewhat chimerical.

There remains, however, some point to the theoretical criticism upon the private absorption of the interest income, particularly when the recurrence of more static conditions has brought low wages and leisure classes. Socially it is difficult to rationalize the fact that, even in so dynamic a country as our own, to judge from King's estimates, there must have been paid out as interest in 1910 (including profits going to capital as such) some ten or twelve billions of dollars, while scarcely more than three billions were being added annually to capital values. Apparently if society could so organize itself as to avoid the practice of paying people to save, it would be better off. Earlier stages of growth might be slower, but at least the future would not be mortgaged to a hereditary class. But such reasoning is futile. It overlooks the fact that society is not based on collective intelligence, but on instinct. The instinctive passion for the supremacy and freedom that wealth accumulation brings to oneself and heirs is ordinarily a dominant motive of mankind. Hence we may expect that for a considerable time to come, there will continue the historic rhythm of dynamic and static periods, with their alternating democratic and aristocratic swings, and the accompanying group competition and international friction.

II

We have attempted to show that the rate at which interest incomes are capitalized is a resultant of the interaction of the demand for established incomes, and the rapidity with which invention makes possible the improvement of income-yielding agents. But in the determination of the actual market rates the mechanism of finance is of great importance. A rate of three per cent a day, for example, which has at times of crisis appeared in financial centers, is evidently not a product of normal time preference nor of inventional progress. It is a measure of some sort of stringency arising out of a jamming of the financial machinery. We must turn, then, to a brief consideration of the problem of bank discount and price levels.

The function of gold as a medium of exchange will require only a passing mention. It is a truism that price levels on a strict gold basis are an inverse expression of the value of the basic metal, which has a commodity use as well as a monetary use. High price levels express a cheapening of gold, stimulating its use in the arts, and checking its production, unless more efficient mining processes have been adopted. Low price levels, on the other hand, make a bid for gold by offering more goods for its production. Allowing for certain shifting factors, such as changes in the volume of business and in the customs or laws determining private and banking stocks of money, it may be said that a normal price level is one which draws in and holds the amount of gold that can be maintained in equilibrium as the basis of exchange. About such a norm the price level of a gold economy will fluctuate. A surplus of money bids up prices, and abnormal prices react to drive out gold. A consequent re-

versal to low prices draws in gold, which in turn restores prices. This statement holds even after allowance is made for the complicating effects of credit currency. The marginal cost of producing gold will therefore tend to equate with its value, both in the arts and in circulation.

But a purely gold circulation is hypothetical. For reasons of convenience and economy there always exists a demand for credit representatives of the standard unit. Into the circulation of the basic currency is injected a flood of credit, of which the bank check is the most flexible and ubiquitous type. Government paper has a more authoritative acceptability, but is of somewhat the same nature, except that it may be pushed beyond the limits of convertibility, and that, as reserves, it constitutes with gold the required foundation for bank credits.[1]

It appears both theoretically and experimentally that the injection of credit instruments into a commerce based on gold will have the same effect as the sudden appearance in the circulation of so much more of the metal. Prices will be driven up, and gold will eventually be pushed out into the arts, and its production checked. A part of this outflow will, however, be absorbed by the increased stocks of the cheapened money, and by the demands of a heightened volume of business. Also, if the inflation is limited to a given area, an unfavorable balance of trade will quickly bring about an export of the gold reserves. But, in spite of such limiting factors, it is conceivable that credit inflation may proceed to such a degree as to drive practically all the gold into the

[1] No definite percentage of bank credit to money appears to be necessary or inevitable. The ratio is established by custom or legislation at such a point as is felt to be safe in view of possible fluctuations in demand for reserves. But changes in such customs or laws have important effects, and sometimes permanent effects, the immediate consequence being that they either throw a surplus of gold upon the market or draw a quantity away, and so produce a temporary inflation or deflation until a new equilibrium is established.

arts. Indeed, when backed by the authority of government, credit issues may be forced beyond the metal basis altogether. Yet, if issued with caution by a responsible government, they would apparently maintain a value determined by their monetary use. Together with the bank credits legally based upon them they would measure the volume of business. In terms of this volume and of the velocity of circulation, each unit of the currency would automatically come to define itself.[1]

We are, however, more concerned here with bank inflation, which will have certain sharp limits not felt by a government. A bank cannot easily repudiate convertibility. It cannot, therefore, push the issue of deposit currency to a point that will wipe out its coin and legal tender reserves. The degree of inflation will be controlled principally by a raising or lowering of the discount rate. What, then, are the factors determining the point at which the discount rate will come to an equilibrium?

It can be shown theoretically that the point of equilibrium about which the discount rate will fluctuate, will be the market interest rate as determined by forces of capital supply and demand already discussed. For if banks underbid the current rate they are eagerly drawn upon for deposit currency, because of the additional profit that may be made in the expansion of business and in the speculative purchase of properties. A continued low rate — low with reference to the standard inherent in actual business conditions — would therefore cause a continued rise in prices and an eventual loss of reserves. Since deposit currency is in effect commercial paper with a bank endorsement, it may be seen that such inflation would constitute a virtual debasement of the currency,

[1] Cf. R. G. Hawtrey, Currency and Credit, chap. iii; also Edwin Cannan, Money, and J. S. Nicholson, Inflation.

since a low interest note, however well secured, is not really worth its face value. The banks cannot, therefore, maintain a low rate, but will be forced to protect their paper and reserves by changing to a high rate, which in turn will cause deflation. Deposit currency will be cut down, with a corresponding lowering of prices and drawing in of gold. This process will, however, reverse itself when a reserve has again accumulated, since the banks cannot afford to let surplus reserves lie idle. Nor can they long restrict the currency by a high rate without attracting competitors into the field. Because of the resulting fluctuation of discount about interest, the former shows several times the range of variation that is shown by bond yields.

A complication in connection with the demand for deposit currency arises from the fact that there are really two price levels, a primary one of commodities, and a secondary one of properties. So far as the effect upon gold is concerned, it is apparently the commodity level that is the most important, but the property level has also some bearing in that its rise makes an added demand upon the medium of exchange. These two levels are related by the interest rate, since properties are capitalized in terms of their anticipated income divided by this rate.[1] When therefore a general lowering of interest takes place, property values soon show a marked increase in volume. As this usually occurs after a period of conservative saving, when business enterprise is reawakening, considerable bank inflation is then evidently justified; but it is easily overdone, because the fundamental conditions shift. The recurrence of high interest deflates property values, decreasing the demands upon currency, and rendering insecure some of

[1] In a minor degree the changing interest rate may affect the value of any relatively durative commodity, since future uses are theoretically discounted in present prices.

the mortgages placed at the earlier period. The result is an unavoidable intensification of the inflation swing.

Bank discount stands at the focal point of commerce where the more fundamental price and interest levels meet and interact. Its strategic position has been most conspicuously illustrated in the functioning of the Bank of England in pre-war times. The management of this bank enjoyed an exceptionally high prestige because of its exact knowledge of business conditions and its close relations with other banks. When it raised its rates, therefore, other banks followed suit, business contracted, exchange was modified, and gold flowed in. Because of London's dominating position in world trade, the effect was felt everywhere. When reserves had accumulated satisfactorily, the rate would be lowered, and gold would go out. With such movements of bank discount, business cycles are closely related.

When viewed from the standpoint of its effects upon business activity and price levels, the power to set the central discount rate appears like the act of an absolute monarch. Yet the appearance is deceptive, for the power necessarily has very narrow limitations. The discount rate must reflect fundamental conditions, or it will defeat itself. The belief somewhat prevalent today that price levels may be controlled by the rediscount rate of the Federal Reserve system has only a partial foundation in fact. Assuming that the central rate could control the local rates, one might expect that an alert and delicate control would lessen the fluctuations of prices, but it could not reach the causes determining the trend.

The financial situation now obtaining in Europe and America may be referred to briefly by way of illustration, tho the details lie outside of the scope of this paper, which has essayed merely a statement of certain prin-

ciples. It is, of course, a patent fact that in varying degrees Europe is suffering from extreme inflation. Even conservative England has found it necessary to enforce rigid laws against the export or conversion into bullion of gold coin, which has gone to a considerable premium, as is partially revealed by the state of the exchanges. The situation to begin with was the outgrowth of the sudden demand for goods needed to support the war. Commodity gold was naturally cheapened, leading to a falling off of demand for it, and in fact to the melting of a certain amount of plate for banking purposes. The tendency toward inflation was intensified by the withdrawal of gold from circulation into reserves, by low discount rates, and by government issues of virtually inconvertible paper. Much of the cheapened bullion moved to neutral countries, carrying with it a wave of high prices.[1] The large amounts coming to the United States in payment for war supplies became the basis of a credit inflation, which was augmented by the laxer provisions of the Federal Reserve system as regards reserves. Yet we have remained upon a metal basis in spite of the soaring prices, which apparently were inevitable as a consequence of the war-cheapened gold, the scarcity of certain goods, and the change in the banking basis.[2]

That a natural reaction to lower prices will set in is indicated by the lessening of gold production, by the increased use in the arts, by recent exports to the Orient and elsewhere, and by the consequent lessening of reserves.[3] The rediscount rate has therefore recently been

[1] There was, however, a brief period at the opening of the war when gold flowed into England because of the sudden cessation of the discounting of foreign bills of exchange, and the checking of other investments affecting the exchange rates.

[2] A very pointed statement of the inflation process and its consequences in the United States is that appearing in the publications of the Bankers' Statistical Corporation, January and February, 1920, by Professor E. W. Kemmerer.

[3] Annalist, February 16, 1920, p. 246.

raised, and will probably go higher, since reconstruction work will produce a high rate of interest. Whether the rediscount rate will control the general credit rate remains for the experts, or experience, to determine.[1] As conditions gradually become more normal in Europe, it may be expected that commodity gold will move somewhat toward its old level, or rather toward the level indicated by the rising trend that begun about 1896. The greatest obstacle lies in the strained and impoverished conditions of Europe — conditions that may be materially relieved by further extensions of American credit.

Since bank inflation is so intimately connected with fluctuations in price levels, it must evidently be taken into account in any comprehensive plan for the stabilizing of the measure of value. Doubtless business cycles are initiated by natural and psychological conditions affecting the commodity value of gold, such as changes in the relative cost of production of goods and gold, and the abstemious or extravagant moods of the public. But there is no doubt also that they may be greatly modified, either favorably or unfavorably, by banking methods. In regard to the widely discussed plan for a compensated dollar, it may be observed that it is aimed at forces affecting the trend of prices rather than the fluctuations, tho its effect upon bank inflation would probably be favorable in hastening the reaction. Other plans for controlling the trend of gold are possible; for example, a government monopoly of gold production, which could be made effective if England and America should coöperate.

[1] The Bankers Magazine (January, 1920, pp. 8 ff.) assumes that such control can and should be exercised. Hawtrey also takes the same position, on the basis of English experience. But it may prove that additional checks in the way of restrictions and penalties will be found essential to an adequate control of inflation. Since the funds secured by rediscounting may be multiplied in the form of loans, a comparatively high rate is not necessarily effective.

But whether or not any practicable plan can be introduced for controlling the basic unit, there is no question of the immediate advantage of a centrally controlled and closely articulated banking system. With such a system thoroly worked out, it might be possible eventually to control price levels without reference to any basic metal, through the regulation of a primary credit currency and the discount rate in conformity with a price index and current interest demands. At least, such a possibility may be deduced from the quantity theory. But the problem for the present is the gradual improvement of the Federal Reserve system, and the education of the public to a clearer comprehension of the functions and limitations of banking.

The effect of the mechanism of finance upon interest rates may be summarized as follows. Discount normally coincides with interest, but it fluctuates more widely than does interest, and attracts the latter somewhat from its course. When discount is lower than interest, deposit currency increases, prices tend to rise, and gold reserves to be reduced. When discount is higher, the opposite tendency obtains. The degree of consequent fluctuation of discount and prices depends upon the centralized efficiency of banking control. It is, however, only to the extent of these fluctuations — allowing for certain minor shifts occasioned by law and custom affecting reserves — that discount may be said to control prices. Fundamentally, interest depends upon time preference as modified by productive progress, and price levels depend on the relative valuation placed upon the standard metal as against goods.

GEORGE R. DAVIES.

THE GERMAN CAPITAL LEVY TAX

SUMMARY

The author's proposal of 1917, 462. — The law of 1919, 463. — Other tax law, 469. — Administration importance, 469. — Why no severe sacrifice was made, 470.

THE editors of this journal have requested me to follow the legislative developments in connection with the extraordinary property tax just levied in Germany. I assume that the reason for choosing me for this commission is the fact that I was the first to advocate a large contribution from property owners for public purposes, and to work out a detailed plan for putting this into effect. I can perhaps best execute my commission by comparing the provisions of the completed law with my own proposals. The financial experts of all countries will be interested in the solution of the problem which has been worked out in any one.

My book was written in 1916 and appeared in April, 1917. Without regard to the outcome of the war, it urged the citizens to feel a spirit of solidarity with the Empire, to regard its debts as their debts and its obligations as obligations on their own property. The condition (even then!) of the national finances, with respect to future needs, rendered it unnecessary to advance any special reason for asking the citizens to turn over a part of their property to the Empire. There was need rather of a reason why any of our property should be left us, when others had lost all their property, their sons, their fathers, and their own lives. To keep the discussion

from becoming involved in a controversy as to whether such a large levy was really a tax or a confiscation of property, I proposed a new name for the new thing. It should be called not a tax, but a "sacrifice." [1]

On the last day of last year (December 31, 1919) was passed the National Emergency Sacrifice law (Gesetz über das Reichsnotopfer). The name which I proposed is adopted, and has been incorporated in the impressive words of the first paragraph: "Ownership (Besitz) makes a sacrifice to the extreme need of the nation by a large contribution from property, in proportions determined by the provisions of this law."

But the agreement on the name and the recognition of principle do not indicate an identity in substance. They would not indicate so much even if the content of my proposal and of the law were the same. For there would still remain the difference of the times. What was possible in 1916–17 has already in part become impossible in 1919–20. And so far as it would still be physically possible, it has again been demonstrated that enthusiasm is no herring catch which one can pickle for years at a time.

But with respect to its substance also I do not recognize in the Reichsnotopfer the universal sacrifice which I had suggested. I had stressed universality not only on account of the financial effect but also because it

[1] J. Jastrow, Gut und Blut fürs Vaterland (Vermögensopfer — Steuerfragen — Erhöhung der Volkswirtschaft), Berlin, 1917, Georg Reimer. Hereafter referred to as Gut und Blut. As the title indicates, the book treats contemporary questions of taxation and economics at large, and seeks to do them all justice from the point of view of practicability. But the property contribution (Vermögensopfer) is placed at the front and stressed as the foundation for every financial innovation, pp. 3–92 and the bibliography, pp. 267–285. As a supplement to this see the pamphlet, Deutschlands Volksvermögen im Kriege. Ein Beitrag zur Frage: Vermögensopfer und Kriegsentschädigung, Berlin, 1919. Julius Springer, second enlarged edition (also in English and French editions). The most complete survey of the reasons for and against a single capital levy is found in the collection, Die Neuordnung der Deutschen Finanzwirtschaft, published in the Proceedings of the Verein für Sozialpolitik under the editorship of H. Herkner (vol. 156 of the Schriften). Leipsic, Duncker and Humblot, 1918.

seemed to me morally significant that a whole people from its highest to its lowest strata should gather for a sacrifice. And besides there was a statistical motive, that of discovering just what we possessed in the way of wealth, of obtaining the "property cataster" desired by all economists. I had attached so much importance to this cataster that even if it had been necessary to make concessions in the matter of collecting tax, I nevertheless was unwilling to give up its full assessment. (Thus, for example, if it were granted that the nation should not go through the pretense of taxing itself, nevertheless the state should be assessed, in order to have its property listed in the cataster, the tax being left uncollected.) [1]

The principle of universality was abandoned by acceptance of the familiar reasons urged against the taxation of tangible personal property (only gold, silver, jewels, works of art, and similar collections are taxed, in order to prevent evasion of the law by such "investments"). Since household furnishings constitute the only property of most men, the great majority are freed from the sacrifice that was to be universal. In addition there is in paragraph 5 a long list of property owners who are granted exemption:

1. The several states;
2. Municipalities and municipal associations of all kinds;
3. Churches and ecclesiastical and religious societies;
4. Universities, colleges, and similar institutions and societies; further, such institutions as are regularly supported, in whole or in part, by the nation or a state or other public body when their own means do not suffice, as well as foundations whose activities are taken over, in whole or in part, by the nation or a state or other public body when their own means are inadequate;
5. The national bank, the national loan offices, and the state banks;
6. Public savings banks or those serving the public at large, so far as they confine themselves to the care of their own savings busi-

[1] Gut und Blut, pp. 15, 68–70, 270 (bottom) and passim.

ness, as well as credit institutions founded and conducted for the community's service by public bodies;

7. Chambers of commerce, trade associations, workmen's associations, farmers' associations, and similar public professional organizations as well as economic associations without legal standing as public bodies whose purpose is not the conduct of business;

8. Institutions of the national accident, infirmity, and sickness insurance, and for insurance of employees;

9. Other institutions for annuities, widows, orphans, death, sickness, and the like;

10. Foundations, institutions, or societies, which devote themselves to charitable or socially beneficial activities without limitation to a restricted circle of beneficiaries;

11. Political parties and clubs.

The exemption of small properties up to 5000 marks is economically unjustifiable, as I believe to have demonstrated in detail.[1] The size of one's property gives in itself no standard of ability to pay. Most of all, the long list of public and quasi-public bodies that are exempted is evidence of lack of clear thinking. The almost superstitious regard for "charitable" foundations should have been shaken by the almost ludicrous examples of outlived foundations — but in vain. Some blood letting would have here been helpful. The various allowances to individuals are to be judged somewhat differently. In case the taxpayer is "economically endangered," payment may be postponed without interest till his death. Under certain conditions persons of advanced age are allowed a deduction of from one-fifth to one-third. These are alleviations of a kind admissible in so novel a measure. But the law has gone much farther. Herein appears the futility of a parliament which always tries to make a vigorous principle of taxation palatable to the electorate by concessions big and small, even if the character of the law is lost thereby. Not only are the first 5000 marks of all properties exempt,

[1] Gut und Blut, pp. 14–18.

but a married man can deduct another 5000 marks for his wife, and, if they have more than one child, another 5000 marks for the second child, and so on for each additional child. In the process of assessment, further privileges are accorded. The law distinguishes three kinds of property: landed property, business property, capital property.[1] The first two receive the privilege of being taxed on only 80 per cent of the assessed value. If they are agricultural properties, they have two further privileges: not the ordinary value (selling value) but the year's purchase based on the income is taken, and for this twenty years' purchase is taken, instead of twenty-five as formerly. Allowing for the 20 per cent exemption from the assessed value, we see that agricultural property is taxed on $\frac{4}{5}$ of $\frac{4}{5}$, or $\frac{16}{25}$ of its value. And since valuation based on the year's purchase is often considerably below the real figures, the result of the combination of privileges is that many an agricultural property is taxed at only a half of its value.

And now finally the principal point: what percentage of the property is to be contributed? When I wrote my book, I thought that everyone should sacrifice about one-fourth of his property; others asked a third. With equality of contribution on this fundamental basis certain modifications were not inconsistent. The law, however, has left nothing of the idea that everyone should sacrifice a specified part of his property on the altar of the Fatherland, but made an ordinary progressive tax of it. The lowest parts of every property are to pay 10 per cent, the next parts 12, 15, 20, finally the highest 65 per cent. For example, the owner of property

[1] The readers of this journal must not be surprised if they find it difficult to understand the exact delimitations of these three expressions. The first two are innovations of the legislator; the third expression is old, to be sure, but the meaning given to it is narrowed. The words used in the law are Grundvermögen, Betriebsvermögen, Kapitalvermögen; those of the author are Grundbesitz, Betriebs Kapital, Sonstiges Kapital.—Ed.

worth 400,000 marks is to pay as follows (ignoring trifling deductions such as the first 5000 marks):

On the first	50,000 marks,	10%	5,000 marks
" " next	50,000 "	12%	6,000 "
" " "	100,000 "	15%	15,000 "
" " "	200,000 "	20%	40,000 "
Total			66,000 marks

On this scale, therefore, the tax amounts to only 16.5 per cent. Only on properties of a million marks does it reach one fourth. And even this sacrifice is not " laid on the altar of the Fatherland," but is to be met in small annual installments. It was granted on all sides, to be sure, that the taxpayer must be allowed a certain liberty in spreading his payments over several years. But if a period of not exceeding ten years was thought of for this, a great incentive to immediate payment might have been supplied by high premiums. Now, to put it briefly, the payments are spread once for all over thirty years, and in the case of agricultural property over fifty years. The inducements to early payment are insignificant in comparison with the possibilities which offer themselves to the taxpayer for so long a time. The opponents of the tax are right: why should children and grandchildren pay taxes till 1950 or 1970 on a property as it *was* on December 31, 1919 (the day of the assessment)? If such a long drawn-out arrangement is desired (a permanent one, humanly speaking), it is obviously more rational not to base it on property that once existed, but on one that is to be. To put the case differently, we should not give the name " property sacrifice " to what has become an ordinary property tax, and is more accurately to be construed as such.[1] In view of all this it was consistent

[1] Cf. the comprehensive section on applications to particular kinds of property in Gut und Blut, pp. 13–89, and the statistics, pp. 272–285. In the volume of the Verein

to drop entirely the problem of getting rid of the national debt. The application of the receipts from the tax is left for later determination in the national budget.

The debates on the law have offered nothing that alters my views. The objection that " theory " concerns itself only with principles and not with practical considerations is nothing but the repetition of empty phrases. In the whole history of finance a new plan never has been offered to the financial authorities worked out in such detail as that of the " property sacrifice." To demand that theory should work out every detail would be reasonable only on the assumption that the practical experts had no capacity for thought whatever.

It will not suffice, however, in the present situation, if I simply say that I stand by my proposals. Today these are no longer sufficient. The proposals of Kuczynski, which appeared two years after mine, go considerably farther not only as regards amount but as regards character. And today, after so much valuable time has been lost, and (as everyone knows) after large amounts of property have taken refuge in foreign countries I must assent to demands which go farther than mine. The new idea presented to financial theory by Kuczynski is not that of raising the levy to a half, but the proposal that the transfer of title to the nation should take effect not after and in consequence of the assessment but by virtue of the legislation itself.

After this unqualified statement of my opinion, I should add, to avoid misunderstanding, two considerations.

First: The law here discussed does not give a picture of the whole burden imposed on property by our tax

für Sozialpolitik there is a monograph on financial execution by Somary and valuable discussion by Diehl (in favor) and Dietzel (against).

system. In fact the new tax system has accomplished very considerable results in burdening property *in other laws*. A heavy inheritance tax will lay, as the generations succeed each other, an increasingly large burden on all property at progressive rates. A special tax is to be levied on income from capital (only a proposal as yet). The land and business taxes will continue, as before, to divert to the communal exchequers a part of the yields from land and business. The various war taxes reach the accretions of property during the war almost completely. In addition, the income from property is reached in the general income tax, which even before the war had reached an admittedly high development in Prussia, and which the nation is about to develop considerably more. A tax on luxuries is found in a place where one would not seek it without guidance: the tax on sales. And finally, our tax reform is not yet completed: taxes on expenditures, the taxation of the Dead Hand, the tax system of the municipalities still await legislative consideration. The present study is limited to its stated object.

In the second place, the significance for us of all the present national tax reform lies in a different direction from its mere contents. No American can conceive the extent to which the German Empire lacked an independent administration. The American is accustomed to see in every large city the federal building, in which the postoffice, courts, and customs service are located. The German Empire possessed postoffice buildings, it is true, but with the exception of the imperial court at Leipzig no kinds of courts. Tho the Empire could levy taxes and customs duties, for their collection and administration it was completely dependent on the states. This ceases all at once. For its new taxes the nation has set up its own administration (tho these offices have

received the misleading name "state tax offices"). The organism which we have lacked so long is now at hand. And where organic life is once created, we may be confident existing defects will be physiologically effaced. History teaches that it is immensely more difficult for a nation to create a consistent tax system out of nothing than to make a good system out of a bad one.

The reader will perhaps ask how it is to be explained that a people whose need is as dire as that of the Germans has not turned at once to a real sacrifice of property.

The chief explanation is to be found in the fear that the revenue from a sacrifice of the kind will be appropriated by the Allies and therefore will not serve the purpose of financial rehabilitation. Now, it is true that the Treaty contains provisions so severe that it is difficult to find terms in which to characterize them; provisions which leave only one possible ground for hope, namely, that that which cannot be carried out cannot come to pass; as for example, provisions which are economically inconsistent. But the fear intimated above, nevertheless, is doubtless ill-founded. The stipulation in Article 248 of the Treaty, by which all revenues of Germany are pledged in the first instance to the fulfillment of her obligations, are applicable to the yield of any and every measure of tax reform. In fact, it amounts to nothing more than what would have been incumbent upon Germany even if no specific statement were made in the Treaty. The same may be said of another part of the Treaty (part 8, appendix 2, section 12*b*) which has aroused great anxiety in Germany. It is there stated that the Allies reserve to themselves the right of recurrently examining Germany's capacity to pay, in order to make sure that all revenues are devoted primarily to meeting the obligations for reparation. It is true that the Allies, on the basis of this paragraph, might con-

ceivably appropriate all moneys received, e. g., for railway passenger and freight service; but obviously in such case the receipts would disappear, very much as would happen to any creditor who was so foolish as to proceed to the annihilation of his debtor. The Allies doubtless have the power to impose upon us any sort of financial terms, but it is also clear that it is to their interest to make our financial system more productive through having it framed by ourselves.

None the less it remains true that the argument just cited has had a deadening effect. The fear of interventions which cannot be foreseen and cannot be rejected, the depressing feeling that Germany's obligations so far have not only been left undetermined, but that not even a beginning has been made toward considering the precise amount — all this necessarily makes a people disinclined to embrace any large scheme of financial rehabilitation. The movement for a tax on property did not meet with the vigorous response which might be elicited even from a nation that has been conquered and deprived of its best resources. If we would go deeper into the analysis we must face the fact that the financial development and capacity of a people do not rest on economic causes only, but are part and parcel of its entire physical and moral development. Life in Germany now presents many enigmas. After reflection on all possible causes, nothing remains plausible except the verdict of the physicians: undernutrition suffered through a period of years has produced psychical consequences which still endure.

What now of the future, and the capital levy tax, and the sacrifice of property ? A part of our property has already eluded the German legislator by flight to foreign countries. Still another part is endangered in the same way. Let us make a virtue of necessity. We may de-

duce the lesson that every country which is concerned with this problem will have the same experiences. If, however, all pull themselves together in order to meet the task in common, evasion across national frontiers will not be feasible, at least so long as one cannot emigrate to the moon. All countries have in the essentials a common concern for their finances. Let them follow a common direction and they will find the way out.[1]

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[1] In the German law there is a provision which perhaps deserves attention because it contains the first intimation of international reciprocity. Section 4 of the act provides that the amount paid by a taxpayer out of his property will be repaid him insofar as it has been contributed from landed property or from capital on which levy has been made by a foreign state for a tax of the same sort. This proviso is not made conditional on reciprocity in the foreign country, altho it would seem impossible of execution without such reciprocity.

IS COMPETITION IN INDUSTRY RUINOUS

SUMMARY

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IT is a generally accepted view that competition among railroads, unless restrained, tends to become "ruinous," that is, fails to establish a normal level of rates sufficiently remunerative to attract the additional investments of capital that recurrently become necessary.[1] The main explanation of this tendency toward ruinous competition is the proportionately large investment in fixed and specialized plant.[2] The large investment in fixed plant gives rise to large fixed expenses, that is, expenses that do not vary in proportion to changes in the volume of traffic; and it thus pays a

[1] See Ely, Outlines of Economics (1916), p. 199. Professor Knauth defines destructive or ruinous competition as "that which forces prices to a point where the capital invested receives no return, and even fails to maintain its value intact" (Political Science Quarterly, vol. 31, p. 245). But competition may fairly be regarded as ruinous, even tho the capital invested receives some return, if the return is inadequate to attract the requisite supplies of future capital.

[2] If the plant were not specialized as well as fixed, the character of the business might be changed as rates or prices fell. Cf. p. 490.

railroad to attract additional traffic at any rate which exceeds the extra cost incurred on account of the increased business. The rate on this additional traffic need not cover its proportionate share of the fixed expenses, since these expenses will continue whether or no the added traffic be taken; it suffices if the rate is high enough to make some contribution, however slight, to the fixed expenses. The added traffic thus secured may be new traffic or it may be traffic that had been moving over another railroad line. If the former, its carriage represents a net gain; if the latter, it represents a diversion of business not likely to be submitted to by the other road. It is as true of the second road as of the first that its expenses are largely fixed, and therefore it cannot tamely submit to such a loss of its business. If it meets the rate of its competitor, the particular item of traffic affected will fail to make its proportionate contribution to the fixed expenses, but it is better that the competitive traffic make some contribution to these expenses than none. Accordingly the second road will usually meet the rate or even cut it still further, thus leading in all probability to a further cut by the original trespasser until finally the rate may fall so low that it barely covers the extra cost occasioned by its movement. Below this point it would not ordinarily be to the interest of either road to go. But at this point, it is generally conceded, the rate on all competitive traffic may remain for considerable periods of time. If, then, there are present the conditions favorable for such a struggle, that is, transportation facilities in excess of the traffic offered at rates remunerative to the railroad, and a large percentage of traffic that may move by two or more roads instead of being local to any one road, rates may for some period of time be ruinous to both roads. This competition may be regarded as ruinous even

tho the rates are sufficiently high to permit both roads to meet their interest charges (or other fixed charges), providing they are not sufficiently high to permit an adequate return to the stockholders.[1] It should be abundantly clear that rates that deny stockholders adequate dividends as well as those that deny bondholders their interest on a proper indebtedness will discourage further investments in railways, and will result in an inferior quality of service. The unfavorable effects of such a policy will react injuriously upon the public; and it is therefore to their interest to permit adequate rates in the first instance. It may consequently be assumed that public policy in the long run will demand that where competition is actually ruinous it be restrained in some fashion, in order that there may be maintained conditions that permit investments in railway property honestly and efficiently administered to earn an adequate return.

So much may be said to be granted. Of recent years, however, there has been a disposition on the part of some writers [2] to contend that the above principles likewise apply to industrial enterprises; and therefore to argue that competition is not only an unsatisfactory regulator of prices and profits, but the ruination of industries; that it is a case of " trust or bust." It is the purpose of this paper to analyze this argument. It is proposed, first, to compare railroads and industrial enterprises as regards the tendency to ruinous competition; and, second, by a study of individual industries to consider whether the facts support the claim that the formation of trusts has been necessitated by the ruinous nature of competition.

[1] I assume, of course, that the amount of bonds or stock outstanding is not excessive.

[2] For example, Knauth, Political Science Quarterly (1915), vol. 30, p. 578; and Wyman, Control of the Market (1911), pp. v, vi.

I. Comparison of Railroads and Industrial Enterprises

A. *Statistical Analysis*

Theoretically, the best single index whereby to measure statistically the degree to which competition is ruinous among railroads and industrial enterprises would appear to be the ratio of fixed to variable expenses. If fixed expenses are relatively large, the inducement to cut rates or prices is great; for up to the point of the most advantageous utilization of the plant the expenses do not increase proportionately as new business is taken on. If, on the other hand, the variable expenses are relatively large, the inducement is not great; for new business secured at concessions in rates and prices will be substantially as expensive to handle as the regular business paying remunerative rates. If, notwithstanding the reduced margin between prices and costs, an individual concern persists in bidding for additional business, its competitors can ordinarily afford to sacrifice a part of their business, since as they reduce their output their expenses decline also. They may not make the sacrifice at once, to be sure, but they are likely to withdraw at a comparatively early stage. Where the ratio of variable expenses is high, therefore, we should not expect ruinous competition, first, because the inducement to take the competitor's business is not so great, and, second, because the competitor is not under such insistent pressure to oppose the loss of a part of his business. These observations hold particularly, of course, where the reduction in price perforce applies to the whole output.

Unfortunately, however, the data are not available for a comparison of railroad and industrial concerns in this regard. So far as railroads are concerned careful

computations have been made of the ratio of the fixed expenses to the variable expenses. Thus Professor Ripley finds that approximately two-thirds of a railroad's expenses are constant (or fixed), that is, independent of the volume of traffic.[1] The percentage is different, of course, for different railroads, and fluctuates from time to time, but it is indisputable that up to the point of the most effective utilization of the plant added traffic can be carried without a corresponding increase in costs. As a result there is keen competition for traffic — a competition that tends to become ruinous. In the case of industrial enterprises, however, there is not, so far as I know, any such careful calculation. This is doubtless to be explained by the great diversity of industrial enterprises, which prevents the making of any calculation except one of limited application; and by the fact that industrial concerns are not compelled by law to subdivide their expenses as minutely as railroads, and therefore it is difficult to determine accurately the extent to which their expenses are independent of the volume of business and the extent to which these expenses vary with the volume of business. Notwithstanding the difficulties of statistical measurement, however, it can hardly be denied, I think, that a much larger proportion of the expenses of a typical business enterprise, even one with large plant, is variable than in the case of railroads. This would seem to follow from the large part played in the expenses of industrial concerns by the cost of raw materials, most of which are finally consumed in the act of production, and practically all of which constitute a variable expense.[2] Tho a railroad also finally consumes some materials, such as coal or oil, in the act of giving transportation service, a large part of the materials consumed by it are employed in supplying

[1] Railroads: Rates and Regulation, p. 55.

[2] Cf. p. 491.

transportation facilities and are thus more or less permanent in character, as, for example, rails, ties, timber.

The opinion expressed in the preceding paragraph is borne out by a comparison of railroads and industrial concerns as regards the importance of "interest charges" among their expenses. Tho the term "interest charges" is not synonymous with constant expenses or fixed expenses, since it represents only a part of the non-variable expenses, nevertheless it constitutes such a large proportion of the constant expenses that it may fairly be used as a *measure* thereof. Clearly, therefore, it throws light upon the comparative degree of pressure present in railroad and in manufacturing industries to get additional business. It has the advantage, moreover, of being subject to statistical measurement, as the larger term in the present state of our information is not.

The ratio of "interest charges" to total expenses for railroads and for industrial corporations is shown in the table below: [1]

RATIO OF INTEREST CHARGES TO TOTAL EXPENSES (1914)

Railroads (operating), Class I and II roads	Ratio
Eastern District	11.2
Southern District	15.1
Western District	17.0
Total operating roads	14.1
30[2] Industrials	3.1[3]

A word of explanation as to this table. In the case of industrial corporations, tho the term "interest charges" generally means exactly what it implies, in a few instances other items of fixed charges are included also.

[1] The data for industrial corporations were secured in part from Moody's Manual of Corporation Securities and in part by correspondence; that for the railroads from the Statistics of Railways, 1914.

[2] This represents all the leading industrials for which the data were obtainable.

[3] This is an unweighted average.

In the case of railroads in no instance is anything except interest charges included. Such lack of complete comparableness as exists therefore tends to exaggerate the tendency toward ruinous competition among industrials rather than among railroads. The term "total expenses" is self-explanatory; it includes all the expenses of conducting the business, not including, of course, dividend payments and sums carried to surplus. The year 1914 was chosen for two reasons: first, to eliminate the abnormal fluctuations resulting from the war; and, second, to permit comparison with the results of the census of 1914.

An examination of the table shows that for the operating railroads as a whole (Class I and II roads) the ratio of interest charges to total expenses was 14.1 per cent; and that for the three major districts (Eastern, Southern and Western) it was 11.2 per cent, 15.1 per cent, and 17.0 per cent, respectively.[1] For industrial concerns the ratio of interest charges to total expenses was 3.1 per cent; and there are many industrials, not included in this average, which have no interest charges at all.[2] It is thus clear that the constant expenses in so far as these consist of interest charges are four and one-half times greater for railroads than for industrials — greater, that is, not absolutely, but relative to expenses. The probability of rate concessions leading to ruinous competition is thus correspondingly greater. And how much more would this be so did we take as the basis of calculation, not the ratio of *interest* charges to total expenses, but the ratio of *fixed* charges to total expenses. Many rail-

[1] If we included the interest charges of the non-operating subsidiaries of the operating roads the ratios would be 16.0 per cent for all roads, and 13.2 per cent, 16.3 per cent, and 19.1 per cent for the three major districts, respectively.

[2] Among the concerns whose total expenses in 1914 are reported, but which had no bonds, are: American Beet Sugar Co., American Woolen Co., B. F. Goodrich Co., Pittsburgh Plate Glass Co., Sears, Roebuck & Co., United Drug Co. (1917), and Woolworth Co.

roads have large fixed charges, such as rentals of leased lines, no corresponding item for which is ordinarily present in the case of industrial corporations. These fixed charges other than interest charges are often considerable in amount; and their existence accentuates the tendency toward ruinous competition among railroads. Thus the inclusion of the rentals of leased lines would bring the railroads' percentage of fixed charges to total expenses up to 18.2 per cent for the operating railroads as a whole, and up to 16.1 per cent, 17.3 per cent and 20.8 per cent for the railroads by major districts. These figures do not include the other items of fixed charges shown in the *Statistics of Railways*, but are merely interest charges and rentals. It thus appears that at a conservative estimate the industrials' constant expenses in so far as these are statistically measurable are only about one-fifth as large in proportion to total expenses as in the case of railroads. There thus appear to be differences in the degree at least to which competition is ruinous in the two branches.

But, it will be urged, it is not claimed that the tendency toward ruinous competition is present in all industries to the same degree as in the railroad industry, but only in certain industries characterized by large and specialized plant, such as, for example, the iron and steel industry. I have, therefore, prepared the two tables below, showing the ratio of interest charges to total expenses for fifty leading railroads and for thirty leading industrial concerns. The industrial concerns chosen were largely those for which data were available in the financial manuals, or obtainable by correspondence.

RATIO OF INTEREST CHARGES TO TOTAL EXPENSES

Railroad	Ratio of interest charges to total expenses
Atchison, Topeka & Santa Fe	15.3
Atlantic Coast Line	16.6
Baltimore & Ohio	16.8
Bessemer & Lake Erie	3.3
Boston & Maine	7.0
Central of Georgia	14.1
Central of New Jersey	9.6
Chesapeake & Ohio	22.1
Chicago & Alton	18.1
Chicago, Burlington & Quincy	8.6
Chicago Great Western	7.7
Chicago, Milwaukee & St. Paul	17.0
Chicago & Northwestern	12.4
Chicago, Rock Island & Pacific	15.0
Chicago, St. Paul, Minneapolis & Omaha	12.9
Cleveland, Cincinnati, Chicago & St. Louis	11.1
Colorado & Southern	25.7
Delaware & Hudson	12.8
Delaware, Lackawanna & Western	0.5[1]
Denver & Rio Grande	24.1
Erie	17.3
Florida East Coast	22.4
Great Northern	17.7
Hocking Valley	17.6
Illinois Central	11.7
International & Great Northern	12.6
Kansas City Southern	18.8
Lehigh Valley	9.3
Louisville & Nashville	12.7
Michigan Central	6.3
Missouri, Kansas & Texas	20.3
Missouri Pacific	24.8
Mobile & Ohio	11.5
New York Central	13.8
New York, New Haven & Hartford	18.6
New York, Ontario & Western	14.7
Norfolk & Western	12.6
Northern Pacific	20.1
Pennsylvania Railroad Co.	5.8
Pennsylvania Co.	8.8

[1] The per cent would be 16.7 if the rentals of leased lines ($5,898,975) were added.

Père Marquette	17.2
Philadelphia & Reading	4.7[1]
St. Louis-San Francisco	23.2
Seaboard Air Line	21.3
Southern Pacific	11.7
Southern	16.1
Union Pacific	19.7
Virginian	25.5
Wabash	12.2
Western Pacific	43.4
Industrials	
A cordage company	3.1[2]
American Hide & Leather Co.	3.8
American Linseed Co.	6.2
American Locomotive Co.	1.7
American Smelting & Refining Co.	0.5
American Tobacco Co.	0.3
Anaconda Copper Mining Co.	0.9
Atlas Powder Co.	3.9
Baldwin Locomotive Works	4.5
Barrett Co.	2.8
Bethlehem Steel Corporation	4.7
Central Leather Co.	3.3
Colorado Fuel & Iron Co.	10.5
Cuban-American Sugar Co.	8.6
Cudahy Packing Co.	0.2
Deere & Co.	1.7
du Pont de Nemours Powder Co.	3.8
General Asphalt Co.	2.1
General Electric Co.	0.7
Giant Portland Cement Co.	3.8
Hercules Powder Co.	2.8
Lackawanna Steel Co.	11.3
Morris & Co.	0.7
Republic Iron & Steel Co.	4.1
Sloss-Sheffield Steel & Iron Co.	5.0
Studebaker Corporation	1.1
U. S. Rubber Co.	2.5
U. S. Steel Corporation	5.8
Utah Copper Co.	0.5
Westinghouse Electric & Mfg. Co.	4.2

[1] The per cent is low because the Reading Company (the holding company) owns all or most of the equipment of the railway.

[2] This figure was given me upon an agreement not to disclose the identity of the company.

An examination of this table brings out the fact that not one of these industrial concerns had as high a ratio of interest charges to total expenses as the average for the railroads as a whole. Only one (the Lackawanna Steel Company) had as high a ratio as the average for the railroads in the Eastern District, the district in which interest charges were the lowest as compared with expenses. The industry that most closely approaches the railroad industry as regards a large proportion of fixed expenses is, as one would expect, the steel industry. Save for this industry, however, there is hardly one [1] which seems to fall within the same class as the typical railroad concern.

To these conclusions it may be objected that the ratio of "interest charges" to expenses is not an altogether fair basis of comparison, since a concern with large fixed plant may not have seen fit to bond itself heavily, whereas another concern with relatively small fixed plant may have done so. That this is true in individual instances is readily conceded, yet the inclusion of a comparatively large number of concerns reduces the force of the objection. Moreover, in view of the well known fact that the raising of as large a part of the capital as is safe through the issuance of bonds increases the profits of the stockholders, it is to be presumed that manufacturing concerns in general have issued bonds and thus accumulated interest charges to the degree permissible under canons of sound, conservative finance. In fact, it is probable that industrial corporations have been less conservative in this regard than railroad corporations, thus tending to increase the interest charges of the industrial corporations and (so far as this item is used as a measure of the constant expenses) to exagger-

[1] One sugar concern shows a relatively large amount of interest charges, but the average for the three sugar companies included in the table is low.

ate rather than underestimate the importance of fixed plant. On the other hand it should be said that the relatively stable character of the railway business has permitted the resort to bonds to a greater extent, and that the large interest charges are thus not a sure indication of a relatively large fixed plant. It is a question therefore of the relative strength of these opposing factors.

Another method of statistical approach sometimes employed is a comparison of railroads and manufacturing industries with respect to the relationship between the capital investment and the annual value of products (gross annual revenue in the case of railroads). The underlying assumption, of course, is that industries with large capital investment as compared with gross receipts would be subject to more severe competition than those industries in which the capital investment was relatively small.

For industries the only available figures are those compiled by the census. In 1914 the capital investment of all industries was $22,790,979,000, and the annual value of the products was $24,246,434,000.[1] The ratio of capital investment to annual value of products was thus 94 per cent. The term capital as employed by the census includes, it should be noted, land, buildings, machinery, tools, materials, stocks in process, finished products, cash, bills receivable, etc. It thus includes many items that can in no sense be regarded as fixed capital.

It is difficult to obtain an item for railroad investment which is strictly comparable with the figure used for industries. One possible item would be the railway capital (outstanding stock and funded debt). In 1914 the railway capital of the operating roads (Class I and

[1] Abstract of the Census of Manufactures, 1914, pp. 516, 517. The statistics of capital investment are not particularly reliable. See Abstract, pp. 11, 12.

Class II) amounted to $17,497,286,000; the gross receipts to $3,047,019,000; and the ratio of capital to gross receipts to 574.2 per cent.[1] The railway capital thus exceeded the gross receipts by nearly five times. To this basis of calculation it will be objected that the capitalization of the railways may be excessive, and in so far as this is true the importance of capital investment is exaggerated. Whether the objection is properly taken will not be known until the valuation of the railways is completed, if indeed it is known then. However, it can hardly be doubted that a "proper" railway capital will nevertheless several times exceed the gross receipts, whereas the capital of industrial concerns is actually less than their gross receipts as measured by the "annual value of products."

To meet a possible objection that "railway capital" is not fairly comparable with the "capital investment" of industrial enterprises, we may employ in the case of railroads the item of "property investment." It is understood, of course, that property investment as presented by the railroads' books does not show the actual investment in property; but since it excludes a considerable number of items (cash, accounts receivable, materials, etc.) that were included in the "capital invested" in manufactures, it undoubtedly underestimates rather than exaggerates the importance of capital in the railroad industry, that is, so far as a comparison with manufacturing establishments is concerned. In 1914 the property investment (deducting reserve for accrued depreciation) of the operating roads (Class I and Class II) was $13,621,714,000; the gross receipts were $3,047,019,908; or a ratio of 447.0 per cent,[2] as

[1] Statistics of Railways, 1914, pp. 31, 55. If we included the capital of the non-operating subsidiaries of the operating roads the ratio would be 664.4 per cent.

[2] Ibid, 1914, pp. 55, 63, 64. If we included the property investment of the non-operating subsidiaries of the operating roads the ratio would be 523.1 per cent.

compared with a ratio of 94 per cent for industries. It is thus evident that in so far as these figures show anything they show that for railroads as a whole the capital investment is much larger proportionately than for industrial enterprises. This would be even more apparent were we to include in the "property investment" of railroads those items, such as cash, accounts receivable and materials, which are included in the census figures of capital investment in industries. The addition of these three items would raise the percentage of capital for the operating roads from 447.0 per cent to 489.2 per cent,[1] as compared with 94 per cent for all industries, or nearly four times more capital for railroads than for industries.

When similar comparison is made between the railroads and those individual industries having a comparatively large proportion of invested capital the same results appear, tho in less accentuated form. Whereas the ratio of capital to annual value of products for all industries was 94 per cent, the ratio for some of the leading industries in which trusts (horizontal combinations possessing monopolistic power) have been established, and in which the existence of ruinous competition might therefore be most expected, are shown below.

RATIO OF CAPITAL TO ANNUAL VALUE OF PRODUCTS

Salt	235.6
Beet sugar refining	227.1
Agricultural implements	206.3
Shipbuilding, iron and steel	200.4
Snuff	196.7
Explosives	172.2
Iron and steel, blast furnaces	145.5
Tin ware	144.3
Watch cases	143.3
Iron and steel, total, including blast furnaces and steel works and rolling mills	137.1

[1] To 583.4 per cent, including the non-operating subsidiaries of the operating roads.

Iron and steel, steel works and rolling mills	136.9
Cash registers and calculating machines	134.6
Starch	122.0
Cordage and twine	121.4
Wall paper	110.9
Malt	97.2
Matches	93.5
Leather	90.5
Petroleum, refining	82.2
Smoking tobacco	71.2
Glucose	68.8
Tobacco manufactures, total	62.0
Cigarettes	60.8
Aluminum ware	56.5
Chewing tobacco	50.1
Cane sugar refining	48.5
Liquors, distilled	44.1
Tin plate and terne plate	39.3
Slaughtering and meat packing	32.3

The industry in this list showing the highest ratio of capital investment to annual value of products is the salt industry. An attempt was made to establish a trust in this industry, but, as will be pointed out later, with a notable lack of success.[1] The industry showing the next highest ratio is the beet sugar refining industry, hardly, as those who are acquainted with the conditions in this industry will testify, one in which there is ruinous competition occasioned by large investment in *fixed* plant. Except for the salt and beet sugar industries there is not one of these industries which does not show a ratio of capital investment to annual value of products less than one-half the corresponding ratio for railroads, no matter which one of the suggested bases for railroads be chosen. The ratio for the iron and steel industry, oftenest cited as the industry of large fixed plant, is less than one-third the corresponding ratio for railroads. The petroleum refining industry stands comparatively low in the scale, as do the cigarette, cane sugar refining,

[1] See p. 516.

tin plate, and meat packing industries. If these comparisons are of any particular value, therefore, they show that while the factors that tend to make railroad competition ruinous may be present in industry also, they are present to a much less degree.

B. *Some Theoretical Considerations*

The tendency toward ruinous competition, in so far as it may be statistically measured, does not appear to be so great for industrial enterprises as for railways. This conclusion is reinforced by reference to certain characteristics of railways that tend to make competition disastrous — characteristics that, generally speaking, are not present to the same degree in the case of industrials. These differences are hardly in the last analysis differences in kind, but they are probably sufficient to justify a different public policy in the two cases.

1. The railways are characterized by unusually large fixed plant. They thus have large fixed expenses, either in the form of interest charges on the bonds issued to finance the construction of the plant or in the form of sunk costs.[1] The expenses are likely to be in the form of interest payments on bonds, rather than charges on sunk costs, since the return to the stockholder will be larger if the railway borrows (by the sale of bonds) as much as it can with safety. These large fixed (constant) expenses, as already explained, provide a stimulus to secure additional traffic that will make some contribution toward their payment. It is true that large fixed plant is characteristic of other industries also, but not, I think it will be generally agreed, to the same degree as of railways. This opinion is substantiated — I will not say proven — by the great relative importance of interest charges

[1] See Brown, Transportation Rates and Their Regulation, pp. 11, 12.

among the expenses of railroads as compared with industries. The iron and steel industry perhaps comes nearest to being comparable with the railroads in this regard.

A large investment in fixed plant does not of itself lead to rate and price cutting. The inducement is present only when the traffic (or output) is not sufficiently large to utilize the plant most effectively and economically. This condition, however, is more likely to be present with railroads than with manufacturing industries. An increase in railroad traffic may easily compel an increase in plant (double tracking, for example) much greater than can be fully utilized for some time, and meanwhile there will be a persistent pressure to cut rates in order to attract traffic from a competing line. With manufacturing industries, however, an increase in the demand for any given article — corresponding to the increase in traffic in the case of railroads — does not ordinarily produce such an excessive capacity locally, since manufacturing facilities can be increased in a proportion nearer to the increased demand, and since the market for manufactured products is usually wider. An exception, of course, would be the manufactured products that have large bulk and low value. An increase in the demand for bricks, for example, may lead to the construction of an additional brick plant, and thus to a local surplus producing capacity; whereas the same situation would not result to the same extent from the construction of additional shoe factories. Inasmuch therefore as industrial concerns operate more nearly at capacity then railroads, price cutting is not likely to go to such lengths; for the stage is sooner reached when no additional business can be handled, or if so can only be handled at such an increase in unit costs that the quest for additional business becomes unprofitable. As Professor Davenport has said, too many machines to a

given space, too many men to each machine, etc., represent "sins against the law of the proportion of factors." [1]

2. The railway plant is not only large, but it is highly specialized in character. The tendency toward ruinous competition, it should be noted, does not result solely from the presence of large fixed plant not fully employed. For if rates or prices in an industry characterized by large plant fall to an unprofitable level, the plant may conceivably be used to manufacture some allied product, the price of which is sufficiently remunerative. But when the plant is specialized in character, wedded, as it were, to the fortunes of that particular industry, then the tendency toward ruinous competition appears. The railway clearly falls within this group; its roadbed and much of its structures and equipment are suited to no other purpose than the provision of transportation. Even tho the operation of the road bids fair to remain unprofitable indefinitely, most of the capital invested in its construction must remain irrevocably committed to that enterprise. The same holds true of some manufacturing plants — blast furnaces and coal mine shafts for example — but as the war has demonstrated, industrial equipment is rarely so fully specialized and so distinctly circumscribed in its employment as are railways.[2] If prices are very remunerative in other lines or very low in its own line the plant often may be converted to some other use; not so with the railway. This factor of convertibility obviously tends to reduce the severity of the competitive struggle in industry.

[1] Economics of Enterprise, p. 469.

[2] Thus locomotive plants manufactured munitions; automobile plants manufactured ships and aeroplanes; and now some explosives plants are turning to the manufacture of dyes. Again, the International Harvester Company within a few years after its organization (1902) discontinued the manufacture of harvesting machines in two of its plants; and devoted one to the manufacture of gasoline engines, tractors, and cream separators, and the other to the manufacture of wagons and manure spreaders. Report of the Commissioner of Corporations on the International Harvester Co., p. 145.

3. The railway industry is par excellence the industry of increasing returns. This is not only because of the fact of large fixed plant, but because a large part even of its operating expenses are constant in amount, that is, do not vary with the traffic. Thus Professor Ripley points out that over one-half of a typical railroad's operating expenses are constant, and that approximately the same percentage holds for that part of the operating expenses technically known as conducting transportation. This would seldom be true of manufacturing industries, whose costs in much larger degree are comprised of costs of raw materials, which necessarily vary almost directly as the scale of operations. The writer has endeavored by correspondence to secure detailed information with regard to the proportion of costs that consist of raw materials — with slender results thus far. However, seven concerns — three meat packers, one cordage company, one farm implement company, one snuff company and one clothing company — reported that the following percentage of their total cost consisted of the cost of raw materials: 88.8 per cent; 85 per cent; 80 per cent; 86.2 per cent; 75 per cent; 54.1 per cent; and 52.7 per cent. Further confirmatory evidence may be found in the references cited below.[1] In general there can be no doubt that a much larger proportion of the operating expenses of industrial concerns than of railways varies directly with the amount of business.[2] If the realization of this fact deters the ordinary concern from carrying competition too far, how much more so must this be true of those industrial enterprises that

[1] Report of the Federal Trade Commission on the Fertiliser Industry, pp. xvii, 11, 223–228; on the Book-Paper Industry, pp. 66, 67; on the News-Print Paper Industry, p. 90; on the Beet Sugar Industry in the United States, pp. 75, 76; Report of the Tariff Commission on Costs of Production in the Sugar Industry, pp. 14, 15; and Petitioner's Summary of Evidence in U. S. v. American Can Co. (No. 40), p. 203.

[2] This would not apply, of course, to power costs; for these ordinarily become less per unit, the larger the plant.

are to a greater or less degree liquidating propositions. Clearly the producers of iron ore, coal, copper, oil, and nickel have a very definite interest in reducing their output as profits decline, for they are using up an asset that cannot be replenished.[1]

In this connection reference may be made to the argument that whenever an increase in the size of the business unit brings with it a net economic advantage, the competition of competitors ever growing in size will be cutthroat.[2] It must be conceded that if an increase in the size of the business unit continues indefinitely to produce lower costs, monopoly will result, preceded possibly by ruinous competition among concerns striving to be first to reach the low level of costs that results from the production of the total output. But this involves a very large "if." It is more probable that in industry — perhaps not in railroading — the increase in the size of the business unit beyond a certain point is accompanied by rising rather than falling costs. I propose at some later date to subject this matter to searching analysis, since the decision as to the solution of the trust problem primarily hinges upon this point; but for the present I shall assume that there is a stage at which an increase in the size of the business unit in industry no longer brings lower costs per unit of product, and that this stage is reached short of monopoly. The nearness of the approach to monopoly varies, of course, for different industries.

4. The railroad is notably an industry of joint cost.[3] Since many of its expenses must be incurred to provide

[1] With copper selling at a comparatively low price (March, 1919) the larger mines are producing at only half of their capacity, and some of the smaller mines have shut down.

[2] See Hobson, Evolution of Modern Capitalism (1898), p. 121.

[3] See Taussig, Quarterly Journal of Economics, vol. v, pp. 438 ff., and particularly p. 456.

transportation facilities in general, and cannot therefore be scientifically allocated to any particular traffic, the railroad ordinarily charges "what the traffic will bear." But if there is competition between railroads for traffic — to secure the larger returns that result from increased business — rates on articles that can bear a high freight rate may nevertheless fall to very low levels, since the "extra cost" that is definitely caused by the movement of the competitive traffic may be very low. This principle, which is closely connected with the fact of large fixed plant, holds good of course in certain industries, notably those that yield large by-products. For example, an oil refining company may sell lubricating oil and a meat packing company may sell hides at a price so low that it fails to cover its "proper" share of the joint expenses, providing they can recover these expenses and an adequate profit out of the other joint products. But in many industries, such as steel, sugar, tobacco, etc., the by-products are comparatively unimportant.

5. The number of railroads serving a given territory is perforce limited. It is generally agreed that competition is more likely to be ruinous where the number of competitors is few. If the number of competitors is large there will presumably be considerable differences in their costs. Therefore, before the price falls so low as to be ruinous to the industry as a whole, it will prove unremunerative or ruinous to the high cost companies, and they will gradually retire from the field. As they retire the output will decline, and the price will tend to rise again. In view of the fact that in most manufacturing industries the plants are numerous the tendency toward ruinous competition is less active. In railroad competition, however, there are usually only a few companies involved, and only rarely is any one of them carrying all

the traffic that it could economically handle. The motive to compete would thus appear to be stronger.

6. Competition is hardly likely to be ruinous except where a comparatively slight difference in price will cause purchasers to patronize one concern rather than another. This is undoubtedly the situation so far as railways are concerned. In earlier days shippers went "shopping" among the freight agents, intending to ship by the line that offered the best rate. A slight difference in rates at any time will suffice where shippers are able to choose without sacrificing their future position. The same is equally true, of course, of the products of most industrial concerns. However, there are notable instances in the industrial field where this is not the case. Thus, wherever there has been a marked development of brands and trade marks, or wherever competition is upon a quality or style basis, prices may be maintained by the favored concerns, even above a normal competitive level.[1] Thus, competition in the tobacco, sugar, harvester, gunpowder, whisky, starch, bicycle, silverware, and aluminum ware businesses, to cite but a few instances, is held in check in this way. So far as the staples are concerned, there would appear to be no difference in this regard between railroads and industrials.

7. There are reasons for thinking that railways are less likely than industrial concerns to refrain from rate (or price) cutting through a fear of spoiling the market. A reduction in railroad rates for the purpose of more fully utilizing the equipment may result in developing some *new* business, but it is more likely to attract away from another line traffic that will move anyhow. This is because the railways' market is limited for the most part to the population reached by its plant; and once this

[1] See Bell, Quarterly Journal of Economics, vol. xxxii, p. 523.

market has been served, further traffic can be secured only at the expense of competitors. In any event the future market for transportation service is not spoiled; for supplies of transportation facilities cannot be stored up.[1] The reduction of the prices of industrial products, on the other hand, will tend to spoil the future market. In part it may induce purchases by those who would not be in the market at the normal price (one covering costs and an adequate profit), but in considerable measure also it will stimulate those who will buy anyhow to lay in their supplies at the low level of prices. Thus wholesalers and retailers who foresee the prospects of higher prices at a later date will stock up; and when the demand picks up they will feed out these supplies and thereby retard the restoration of normal conditions.[2] The market is in greater danger of being spoiled in the case of those commodities for which the demand is inelastic, since a reduction in their prices by definition fails to develop much new business. If a reduction in prices under these circumstances has any effect, therefore, it must be either to attract away the business of a competitor (to his detriment), or to induce dealers to lay in supplies for the future, which spoils the market. In either event the outcome is injurious to the trade.

Furthermore, price cutting by an industrial concern may spoil its future market by creating an impression in the minds of consumers that the article is worth no more than the reduced price at which it is temporarily sold, thus making it difficult for the company to recover its trade with the restoration of prices to a remunerative basis. This point has especial force where another article may be substituted for the article whose price has been reduced. In the case of a railroad, however, such

[1] A reduction in rates may cause industrial concerns to lay in fuel and other supplies, and thus in a sense to store up railroad service. But obviously this cannot be carried far.

[2] See Marshall, Principles of Economics (1898), pp. 446, 447.

power of substitution either does not exist or exists to a limited extent; and as a result there is less hesitation in cutting rates to secure business.[1]

Notwithstanding the foregoing considerations there are occasions, it must be admitted, when competition fails temporarily to establish a remunerative price to industry. During periods of industrial depression it is quite possible that the price of some, perhaps many, commodities will fall so low that adequate profits are not earned by some and possibly many of the concerns whose output is normally required to supply the demands. Yet this is quite different from saying that competition fails to establish a *normal* price sufficiently high to keep in business enough firms to supply the normal demand. If profits are insufficient during dull times, they are more than sufficient during good times; and the average return is likely to prove adequate. Individual concerns, to be sure, come and go. Those who have made an unthrifty dispensation of the large profits of the good years may not have reserves adequate to tide them over the lean years, but their place is taken by others, and the industry does not die.

Tho the industry does not die, yet the alternation of periods of prosperity and depression is the cause of much uncertainty and suffering. There is thus force to the argument that combination might be permitted as a means of mitigating the fluctuations of industry. Yet this is not what is in the minds of those business men and capitalists who urge that competition is ruinous; what they allege, as expressed in our economic phraseology, is that "competition fails to fix a normal price remunerative enough to attract the recurrently necessary fresh investments of capital." It would appear that competition does not normally break down in this

[1] For this suggestion I am indebted to Professor F. B. Garver.

regard, and that " the advocacy [by this group] of combination as a means of avoiding overproduction and industrial irregularity is commonly but an excuse for trying to build up a monopoly which will restrict production, and secure (or try to secure) regularity at the expense of extra levies on the public." [1]

This phase of the matter may be concluded by an additional citation bearing on the question at issue. " Many persons of the business class," says Professor Taussig, " talk nowadays as if competition were definitively ruinous to producers, and as if there were no escape from disaster except through the trust or *Kartell*." [1] But " competition does not go on automatically, or irrespective of the ultimate outcome. The troubles of capitalists from ' excessive ' competition will bring in time their own cure. People will not continue indefinitely to invest in industries whose profits are wiped out by cutthroat underbidding. The real source of difficulty for the capitalists, not clearly perceived by those who say that modern competition of necessity works disaster, is the constant pressure of new accumulations for investment, and the constant tendency to a decline of profits in known and established industries." [2]

II. Study of Individual Industries

The industry that most closely approximates the railroad industry as regards the tendency to ruinous competition is perhaps the iron and steel industry. As already pointed out,[3] the iron and steel concerns have a comparatively high level of fixed charges, tho not as high as the railroads. The industry, moreover, is characterized by a large investment in fixed and specialized

[1] Taussig, Principles of Economics (1911), vol. ii, p. 53.
[2] Ibid., p. 436.
[3] See p. 483.

plant devoted to the production of a staple commodity, slight variations in the price of which will cause purchasers to switch from one manufacturer to another. The number of producing companies is small as compared with most industries. Small tho it be, yet it is large as compared with the number of railroad companies competing in a given territory. Moreover, the iron and steel industry would appear to be less distinctly one of increasing returns than the railroad industry, since increasing business always involves an increased quantity of raw materials. While there are thus manifest differences in the degree to which competition tends to overreach itself in this industry as compared with the railroad industry, nevertheless the pressure would appear to be distinctly greater than in most manufacturing businesses. This conclusion arrived at on a priori grounds seems to derive some support from the spectacular struggle for supremacy in the business that took place some twenty years ago. The story is familiar to all economists, and need not be reviewed here.[1]

Tho conceding that the competitive struggle between the iron and steel concerns during the period from 1898–1901 might have had disastrous consequences for a number of companies, I do not regard it as established that the outcome of this struggle, had it been allowed to proceed, would have been ruinous to the industry; and particularly if we may assume that a monopoly, if established, would not have been tolerated. Let us divide the struggle into its two phases. The first phase related to the organization between 1898 and 1900 of a number of combinations and trusts covering various branches of the iron and steel industry; the second phase related to the organization of the United States Steel Corporation

[1] For a graphic account see the report of the Commissioner of Corporations on the Steel Industry, Pt. I, pp. 98–106; and Meade, Trust Finance, pp. 193–217.

itself. To what extent may it be said that these were the natural product of ruinous competition? That the profits of the iron and steel manufacturers during the period of depression that lasted from 1893–97 were in marked contrast to those of the palmy days that had preceded the depression cannot be questioned. The steel trade being " either a prince or a pauper " was in the pauper stage during 1893–97, and, combination or no combination, would have undergone a change after 1897 and entered the prince stage. Is it not reasonable to assume that the long continued period of prosperity from 1897 to 1906 would have permitted the steel trade to recoup itself for the inadequate returns of the lean years, 1893–97? This assumption would appear to be reasonable in view of the fact that in by no means all branches of the steel industry were profits inadequate (for the progressive firms at least) even during the period of dull times.

The wire branch well illustrates this point. The wire trust (the American Steel and Wire Company) was organized in 1899. Its chairman (Mr. John W. Gates) when asked before the Industrial Commission whether it was fierce competition that led to the formation of the wire trust replied in the negative. It was formed, he said, " because we wanted to be the wire manufacturers of the world. . . ." " The Consolidated Steel and Wire Company, of which I was a large owner, made in the last three years of its existence between 27 and 28 per cent per annum net. So that ruinous competition could hardly be said to be the reason for driving us together." . . . " Our companies have always made money." [1]

Neither was competition in the tin plate industry ruinous. The profits during the early nineties were enormous. They were so great in fact that many new

[1] Industrial Commission, vol. i, pp. 1033, 1034.

mills were built to avail themselves of these profits. As a result there was a surplus producing capacity, which speedily brought prices down and with them profits. But this competition was not ruinous to the industry. Every witness who testified in the government suit in respect to the financial condition of his own company at the time it was acquired by the American Tin Plate Company admitted either that it was doing a profitable business or was making some profit.[1] The president of the American Tin Plate Company (Mr. Daniel G. Reid) testified before the Industrial Commission that the majority of the tin plate mills were making money — nothing great, but a profit. A number of mills were losing money, but there had been no failures. However, he said, there would have been failures had not the trust been formed.[2] Mr. Griffiths, a manufacturer of tin plate who sold his plant to the trust, testified that during the period of high prices he had made as high a profit as 100 per cent; and that he had never made less than 20 per cent on his investment. Even in 1898, in which year prices were at their lowest, his books, which were open to inspection, would show that he was making a profit of 20 per cent. In his judgment the pressure of competition was not such as to necessitate a combination. Why then was one formed? Because no matter how large a profit a manufacturer was making he naturally, declared the witness, looked longingly toward the period when he was making the greatest profit; and it was only human nature to want to return to that condition.[3]

In the crude steel branch of the industry — as distinguished from the finished products branch — competition was perhaps more keen, yet it was not ruinous.

[1] See Brief for the United States in U. S. v. U. S. Steel Corporation (No. 6214), Pt. I, p. 89.

[2] Industrial Commission, vol. i, pp. 866, 867.

[3] Ibid., pp. 896–898, 903.

Mr. Carnegie, head of the Carnegie Steel Company, characterized the results of the year 1897 (the last year of the industrial depression) as "eminently satisfactory." [1] Mr. Schwab, of the same concern, admitted that the company had earned an average profit on all its output of approximately $4.00 a ton "in the worst of times." [2] The Illinois Steel Company, one of the leading manufacturers of heavy steel products, stated in its annual report for 1897 that it had secured its share of the great increase in production in 1897; that every furnace was then in blast; that the condition of the plants had been well maintained; and that large sums had been expended on betterments and new construction, all of which had been met out of earnings. This company had not been so well off in 1896, to be sure, but this was in part because it had attempted to make large profits on a comparatively small tonnage. To quote from the same report, "There has been a revolution in this condition of affairs, and it seems to have been demonstrated that for the future the policy of small profits on large tonnage furnishes the best assurance of success." Even if, therefore, the profits during 1893–97 were only moderate, they were soon to be followed by much higher profits, resulting from the improved condition of trade and from the reduction in costs made necessary by the lean years of 1893–97.

The formation of the iron and steel combinations and trusts from 1898–1900, tho it greatly restrained competition in several branches of the steel industry, did not eliminate it. Indeed it soon appeared that the formation of these combinations was likely to lead to even more vigorous competition than ever. The mammoth combinations soon threatened to integrate their business so fully as to relieve themselves of all dependence

[1] Brief for the United States in U. S. v. U. S. Steel Corporation (No. 481), vol. ii, p. 96.

[2] Ibid., vol. i, p. 19.

upon each other. Had these threats, some of which had already been translated into action, been fully carried out the result would have been a producing capacity vastly exceeding the demand at remunerative prices, followed by the bankruptcy of the weaker concerns. It is not to be lightly assumed that the averting of the struggle was in the public interest. The struggle would have been a battle of giants, to be sure, but when the smoke of the battle had cleared there would have been something to show for it besides " ruins." The victors — not the victor, for the fight would have ceased long before the elimination of all of the competing concerns — would have emerged, it may be presumed, with plants keyed up to their maximum efficiency and with an ability to produce at a new low level of costs; and the consumers would have been spared the necessity of paying a price for steel products high enough to permit the building up of assets behind the stock that was issued to call off the " dogs of war."

There will be those who will place a different interpretation upon this struggle. To them this whole episode will strikingly illustrate the ruinous nature of competition in the steel industry. They will find in this episode support for the view that the steel industry, among others, is a natural monopoly, like the railroads. However, when it comes to the larger aspects of the problem, it should be borne in mind that the tendency toward ruinous competition in industry is probably at its greatest in the steel industry, the stock illustration of the disastrous effects of competition.[1]

Another industry in which the normal workings of competition may perhaps be regarded as unsatisfactory,

[1] The severity of competition in the steel industry has been intensified, of course, by our protective tariffs, whose restrictions have increased the periodic fluctuations in iron and steel prices. See Taussig, Some Aspects of the Tariff Question, pp. 146, 147, and Bullock, Quarterly Journal of Economics, vol. xv, pp. 208, 209.

as conditions now are, is the anthracite coal industry. We have here a limited and localized natural resource, not subject to foreign competition, the demand for which is distinctly seasonal, and a commodity which, until recent years at least, it was not deemed practicable to store. Moreover, the fixed (non-variable) expenses are comparatively large because of the huge funded obligations incurred by the anthracite coal carriers (or their coal companies) in the process of securing monopoly control of the anthracite deposits.[1] These huge obligations need not have been incurred, had the industry remained on a competitive basis, free from railroad control. But in the situation as it now exists, the only permanent solution of the problem will doubtless prove to be the public ownership of the anthracite coal lands.

We may now turn to an examination of some of the other leading industries that have been subjected at one time or another to trust control.

An important industry in which competition is declared to have been ruinous is the harvesting machine business. In fact, the organizers of the International Harvester Company (the harvester trust) claimed subsequent to its formation that it was the severity of competition that made a combination necessary. They characterized it as "fierce," "demoralizing," and of a character "never known in any other business in the world."[2] One official went so far as to say that competition was so fierce that neither the manufacturers nor the dealers were making anything.[3] Such lugubrious statements must generally be taken with a grain of salt; and in this particular instance they do not appear to be supported by the evidence. The Bureau of

[1] See my Anthracite Coal Combination in the United States, pp. 57, 58.

[2] See Report of the Commissioner of Corporations on the International Harvester Co., pp. 59–61.

[3] Ibid., p. 61.

Corporations in its report on the International Harvester Company pointed out that prior to the organization of the trust most of the larger companies had been making considerable profits, and sometimes very large profits.[1] Some concerns had failed, it is true, but their failure was to be attributed to deficient resources, mismanagement, or poor location, rather than to excessive competition. The tendency of the business, it may be observed, was toward concentration to secure the economies of large scale production; and it was therefore only to be expected that some of the less important concerns could not stand the pace. Their disappearance merely represented the "pains of progress."

Complete and altogether satisfactory data on profits the Bureau found it impossible to secure. Such data as it presented were limited to the five companies that united to form the trust, and generally covered only the five years from 1898 to 1902. These five companies, however, were representative, since they included five of the six leading manufacturers, and since they produced over four-fifths of the total output of harvesting machines. The available data showed that in general the profits of the large companies had been quite adequate during the five years preceding the organization of the Harvester Company. The Plano Manufacturing Company, it is true, had sustained a deficit in both 1900 and 1901, and the profits of the Milwaukee Harvester Company had been low in 1901; but the profits of the McCormick Harvesting Machine Company and of the Deering Harvester Company (easily the two largest manufacturers) had been high in every one of the five years, and the profits of the Milwaukee Harvester Company and of Warder, Bushnell and Glessner had generally been high. It is significant that a committee

[1] Report of the Commissioner of Corporations on the International Harvester Co., p. 62.

appointed to consider the advisability of acquiring the business of the five companies that went into the trust reported that "each of them has for several years enjoyed a prosperous, profitable and growing business. Each of the plants is believed to be in excellent condition and supplied with all the facilities necessary for effective manufacturing." [1] The McCormick Company in particular was growing rapidly. Thus, between 1899 and 1902 its assets increased from $12,000,000 to $50,000,000, all out of earnings.[2] The Bureau of Corporations stated by way of conclusion: "This large increase in the volume of business taken in connection with the comparatively high rates of profits earned on the capital invested is strong evidence of the fact that the companies which originally formed the International Harvester Company were generally not suffering from excessive competition. The combination, therefore, cannot be justified on the principle of self-preservation."[3]

The sugar refining industry illustrates even better than the harvester industry the weeding out process that characterizes a competitive régime. During the seventies and eighties competition in the sugar refining industry was quite keen; between 1867 and 1887 about thirty-six refineries went out of business.[4] However, it should be recalled that it was during this period that the modern movement toward large scale production manifested itself in the sugar refining industry; and therefore a considerable decline in the number of sugar refining companies was only to be anticipated.[5] It can

[1] Brief for the United States in International Harvester Co. v. U. S. (No. 56), pp. 18, 19.

[2] Ibid., p. 8. In part this growth resulted from the fact that during 1899–1901 no dividends were paid.

[3] Report on the International Harvester Company, p. 66.

[4] Vogt, The Sugar Refining Industry in the United States, p. 18.

[5] Professor Bullock has pointed out (Atlantic Monthly, vol. 87, p. 740) that the tariff, by enabling domestic refiners to secure unusual profit, was largely responsible for

hardly be doubted that as a result of the attempt of the progressive refiners to secure the economies of large scale production the producing capacity of the country overran the consuming capacity at remunerative prices, and that for a time the price of sugar was not sufficiently high to afford a satisfactory profit. Yet presumably the companies that survived (twenty-three in 1887, operating twenty-six plants) [1] were those that were quickest to adapt themselves to the situation; and therefore those that were fittest to survive. The elimination of the weaker concerns undoubtedly represented a waste of capital, but I cannot agree with the opinion expressed by Professor Jenks that this waste was a decided injury to the country.[2] The waste, in my view, was more than offset by the reduction in costs consequent upon the adoption of more efficient methods of production. Temporarily therefore competition might be ruinous to the industry — it was permanently ruinous for the refiners that could not stand the pace — but taking a broad view it is reasonable to suppose that prices, tho permanently on a lower level, would nevertheless remain sufficiently high to remunerate the refiners adequately.

On at least one other occasion — and this was after the formation of the trust (1887) — the price of sugar fell so low that there was no profit to the refiners. In order that there might be a profit in the refining of sugar the margin (the difference between the price of raw sugar and the finished product) had during the late nineties to be at least one-half of a cent per pound, and probably more.[3] Yet during the winter of 1898–99 the margin went as low as thirty-two hundredths of a cent.[4]

the excessive investment in the industry; and that the case, therefore, does not illustrate the normal workings of competition.

[1] Original Petition in U. S. v. American Sugar Refining Co., pp. 37–40.

[2] See Jenks and Clark, The Trust Problem, p. 139.

[3] See Industrial Commission, vol. i, pp. 88, 94, 112, 150 (Testimony).

[4] Ibid., p. 138 (Testimony).

However, the low price of refined sugar that occasioned this low margin resulted directly from the attempt of the sugar trust to eliminate its competitors — "interlopers" Mr. Havemeyer called them — and particularly the coffee firm of Arbuckle Brothers, which had been attracted into the sugar business by the large profits prevailing under monopoly prices. The trust did not succeed in eliminating the Arbuckle firm, but it did subject it to a loss of approximately one and a quarter million dollars.[1] The remaining competitors, however, proved more tractable, and all, with one exception, were brought into harmony with the trust. Mr. Havemeyer characterized this particular period of competition as "most ruinous," but if so it was not because competition is perforce ruinous, but because he endeavored (by unfair devices) to make it so for those that ventured to interfere with the trust's control of the industry.

In the tobacco business the first trust to be organized was in the cigarette branch. The American Tobacco Company, organized in 1890, represented a consolidation of five concerns producing 95 per cent of the total output of cigarettes. The concentration of so large a percentage of the country's business in a few hands had resulted from the increasing use of machinery, which was characteristic of the period preceding 1890.[2] The business being thus concentrated, competition was naturally severe. Very extensive advertising was resorted to, and large premiums were given to merchants and consumers. The leading concern, W. Duke, Sons and Company, expended in one year (1899) $800,000 in advertising, or 20 per cent of its receipts.[3] However, not

[1] Hearings on the investigation of the American Sugar Refining Co., 1911–12, pp. 1131, 1132.

[2] See the Report of the Commissioner of Corporations on the Tobacco Industry, vol. i, pp. 63, 64.

[3] Brief and Argument for the American Tobacco Co. in U. S. v. American Tobacco Co. (Nos. 316 and 317), p. 12.

all of this expenditure was made to secure competitive business; in part it was for the purpose of warding off so-called moral legislation designed to forbid the use of cigarettes.[1] There is not a great deal of evidence to show how severe this competition between the cigarette companies was. The Supreme Court characterized it as "fierce and abnormal."[2] Another branch of the government, on the other hand, declared that all of the five companies were doing a profitable and expanding business.[3] The president of the Duke concern admitted that his firm, which was worth about $250,000 in 1885, was worth $7,500,000 in 1889; and that the company's output of cigarettes increased from approximately 30,000,000 in 1883 to 940,000,000 in 1889.[4] Certainly the leading concern found the profits of the business enormous, despite the large outlays for competitive purposes.

Having effected a monopoly in the cigarette branch the American Tobacco Company next turned its attention to the plug tobacco branch. In 1893 Mr. Duke, the president of the American Tobacco Company, endeavored to engineer a combination of plug concerns, but failing in this he instituted in 1894 an aggressive campaign for the control of the plug business. As a part of the competitive warfare prices were cut below cost.[5] The principal brand employed in this fight was appropriately termed "Battle Ax." In 1891 this brand had retailed at 50 cents per pound; in 1894 the price was reduced to 30 cents.[6] This policy of price cutting was accompanied by an advertising campaign which was pushed most vigorously in the territory of the leading competitors. In some sections, indeed, agents of the

[1] Brief and Argument for the American Tobacco Co. in U. S. v. American Tobacco Co. (Nos. 316 and 317), p. 14.
[2] 221 U. S. 157.
[3] Original Petition in U. S. v. American Tobacco Co. (1907), p. 14.
[4] Transcript of Record in U. S. v. American Tobacco Co. (No. 660), vol. iv, pp. 334–337.
[5] 221 U. S. 160.
[6] Report of the Commissioner of Corporations on the Tobacco Industry, vol. i, p. 96.

American Tobacco Company presented every man they met with a free sample of "Battle Ax." If this competition was ruinous to the trust — its losses on the plug business from 1895–98 aggregated over $3,300,000[1] — how much more so must it have been ruinous to the independent concerns that were unable to make up their losses in the plug branch out of the enormous profits of the cigarette business. Its ruinous character resulted, however, from the fact that the cigarette trust was deliberately manoeuvring to force the manufacturers of plug tobacco into a combination; and in this plan it was successful.

The same tactics were employed in the snuff branch with success; and in the cigar branch, but without success. In the cigar branch machinery could not be effectively employed, as in the other branches, and thus small establishments were at no great disadvantage as compared with large ones. As a result competition was and still is the characteristic feature of this branch of the industry.

The whisky industry has often been cited as illustrating the disastrous nature of competition. It cannot be questioned that there have been periods in this industry when the productive capacity was greatly in excess of the consuming capacity at paying prices. The close of the Civil War, for example, found the country with distilleries able to produce three times as much whisky as was demanded.[2] But this situation was the result of ill-advised legislation, and not of the normal workings of competition. The federal government in raising revenue for the prosecution of the Civil War increased on numerous occasions the internal revenue tax on whisky, but in each case it permitted a considerable period to

[1] Report of the Commissioner of Corporations on the Tobacco Industry, vol. i, p. 367.

[2] Jenks, Political Science Quarterly, vol. iv, p. 298.

elapse before the increased rate was to become effective. During this interval distilleries were naturally operated to their maximum capacity; for the stocks thus accumulated were not charged the higher rate of taxation. The profits realized by the distillers during this period were so great that many new distilleries were built to secure a share thereof.[1] Naturally upon the conclusion of the war there was a surplus capacity, and particularly in view of the reduced demand for alcohol in industry, which could not afford to use it in such large quantities at high prices.

To meet this situation there were created a number of pools; and when these failed to bring permanent relief there were organized a series of concerns aspiring to trust control. But these agencies, tho they increased for a time the profits of the distillers, did not succeed in eliminating the evils which they were designed to cure. This was partly because these organizations overreached themselves. In the endeavor to secure large profits they pushed prices to such a point that it was profitable to build new distilleries; and as a result prices fell even lower than they would have done under conditions of free competition.[2] In 1895 the whisky trust (organized in 1887) went into the hands of a receiver. It was succeeded by other concerns ambitious to maintain a monopolistic position, but none of them particularly successful.[3] They not only failed to control the industry, but generally speaking they were unable to earn even normal returns. Moreover, the industry has continued to be characterized by those ups and downs of business

[1] See Bullock, Quarterly Journal of Economics, vol. xv, p. 208; and Jenks, Political Science Quarterly, vol. iv, p. 298.

[2] See Jenks, Trust Problem (1900), p. 149.

[3] The immediate successor of the concern that failed was never a "flourishing institution"; it never paid any dividends; and according to its president "always was a wreck." Industrial Commission, vol. i, pp. 78 (Digest), 840.

which persevere in industries controlled by trusts as well as in those subject to free competition.

There are a number of other industries which it is not proposed to discuss in much detail, but as to which the available evidence indicates that the establishment of a trust was not necessitated by ruinous competition.

The National Cordage Company (the cordage trust) was incorporated in 1887, and by 1892 controlled 90 per cent of the country's output of rope and cordage. Mr. Waterbury, a former president of the company, testified that every concern that came into the trust had been making a profit for a great many years; that they were all practical men and had made fortunes in the business many years before.[1] In part, of course, these profits may have been the result of pools, which were quite common in this industry during the eighties. As is well known the trust was not successful. It failed in 1893; and its president placed himself on record to the effect that there was no advantage in consolidation in this industry.[2]

The National Wall Paper Company (the wall paper trust) was organized in 1892. Tho there had been a profitable pool for several years after 1880, there was an open market for five years prior to 1892. During this period prices were reduced and some manufacturers withdrew from the business, yet a number of the more progressive manufacturers prospered. The president of the National Wall Paper Company stated that most of the manufacturers who entered the trust in 1892 indicated that they would be entirely satisfied if the new corporation earned as large profits as they had individ-

[1] Industrial Commission, vol. xiii, p. 129. Dewing in his Corporate Promotions and Reorganisations states (p. 162) that this industry is competitive, and always has been and still is profitable.

[2] Industrial Commission, vol. xiii, p. 135. Another cordage manufacturer asserted that while there might again be an association in the industry, there would never be another trust. Ibid., p. 163.

ually been making for several years.[1] Apparently, therefore, competition had not been disastrous. However, after an experience of eight years the wall paper trust, finding itself overwhelmed by competition, decided to dissolve; and the operation of the majority of its plants was taken over by the original owners.[2]

The American Malting Company (the malt trust) was formed in 1897. Its organization was not rendered necessary by the conditions of competition. To be sure, competition had been active, and in the period that followed the panic of 1893 times had been hard. However, an investigating committee of the board of directors of the company reported subsequently that the malsters owning the plants acquired by the trust had made money, and that when the company was organized there had been in the trade generally a fair margin of profit.[3] Mr. Dewing in his chapter on the American Malting Company states that "there is no doubt but that the malt houses entering the combination were, as a whole, on a paying basis."[4] Moreover, it is significant that the largest concern — Neidlinger and Sons — flatly refused to enter the combination.

The trust certainly did not mend matters; in fact, it made them worse. Its formation was soon followed by increased rather than lessened competition, with the result that the profits of the trust amounted to less than one-third of the profits of the constituent companies during the competitive period.[5]

The American Bicycle Company (the bicycle trust) was incorporated in 1899. It acquired the property of forty-eight concerns manufacturing bicycles and bicycle parts. A careful investigator states that "there is every

[1] Industrial Commission, vol. xiii, p. 283.
[2] Ibid., p. 285.
[3] Commercial and Financial Chronicle, vol. lxx, p. 479.
[4] Corporate Promotions and Reorganizations, p. 273.
[5] Ibid., p. 304.

reason to believe that the constituent manufacturing companies were earning liberal profits." [1] To be sure, the profits in 1898 were much less than they had been during the halcyon days. During the years immediately preceding 1895 the business had been enormously profitable. The demand for bicycles had far outrun the capacity of the plants, and those who were prepared to manufacture bicycles made very large profits.[2] The business, in fact, was so profitable that a great many people embarked in it expecting to recover their investment in two or three months. As a result in the course of a few years the supply outran the demand, and prices and profits declined. Tho the strongest concerns continued to make money, the industry was approaching a condition, so the vice-president stated, in which it was feared that even the strongest concerns could not realize a profit.[3] As a result the trust was formed.

The establishment of a trust brought no relief. Hardly had it been established when the bicycle craze came to an end; and within three years the American Bicycle Company was in receivers' hands. The next year (1903) a new company was organized to take over the remains of the trust. This company sold most of the bicycle plants or converted them into automobile plants, and by 1906 was operating only three bicycle plants. The next year it also failed. Another reorganization was carried through, the new company operating only one plant, in which it made not only bicycles but also automobile bodies. In 1913, however, it went the way of its predecessors.

The American Can Company (the tin can trust) was formed in 1901. The federal court before which the

[1] Dewing, op. cit., p. 252.

[2] See affidavit of the vice-president of the American Bicycle Co., Industrial Commission, vol. xiii, p. 689.

[3] Ibid.

dissolution suit against this company was tried found in substance that while the industrial depression from 1893–97, combined with a severe price war in 1898, had cut in notably on the profits of the manufacturers, the returns during the years that followed were ample.[1] At the time of the organization of the trust the industry was experiencing great prosperity. A few manufacturers, to be sure, declared that they were not making money during the competitive period, yet a great many admitted that their business had been profitable.[2]

Still other industries as to which it will doubtless be conceded, without adducing any evidence, that competition prior to the establishment of a trust was not ruinous are the oil,[3] aluminum, shoe machinery, camera, nickel, and meat industries.

Another group of industries comprises those in which there is perhaps more ground for supposing that competition was distinctly severe, but in which the establishment of a trust failed to mend matters appreciably.

The corn starch industry illustrates this group.[4] Up to 1880 this industry grew very rapidly. During the course of the next decade the trade was characterized at times by overproduction, low prices and high selling expenses. It is noteworthy that the operation of competition was unrelieved by pooling agreements of any kind.[5] The first vice-president of the National Starch Manufacturing Company, organized in 1890 as the starch trust, in an affidavit stated that "the producing capacity

[1] 230 Fed. 865.

[2] Petitioner's Summary of Evidence in U. S. v. American Can Co. (No. 40), pp. 40–72.

[3] With respect to this industry the Federal Trade Commission said: "There appears to be no economic necessity of monopoly in the petroleum-refining industry." Report on the Price of Gasoline in 1915, pp. 146–148. With respect to the social undesirability of plant duplication it said: "The cost of such duplication is the price of competition, and, in the judgment of this Commission, in this industry competition is worth the price." Ibid., p. 154.

[4] See Dewing, op. cit., chap. ii.

[5] Ibid., p. 53.

of all the plants together was considerably beyond the need of the market at remunerative rates "; that some plants had been closed; that others were in receivers' hands; and that the best concerns were making some money, tho not much.[1] However, he also stated that had the owners of the efficient plants realized the condition of the poorer plants, they might possibly have decided to remain outside of the organization and to have attempted to drive the poorer plants out of existence. Instead the poorer plants were purchased and closed, thus saddling the trust with their cost. From the point of view of the public it would probably have been better had these inefficient plants been allowed to shuffle off through the usual process. Be that as it may, the trust in 1893 was obliged to pass the dividend on its second preferred stock because of excessive competition and dull trade, and shortly thereafter the dividend on the first preferred. To escape the consequences of the highly competitive conditions that continued to prevail a new trust was formed in 1900 under the name of the National Starch Company, and most of the competitors were absorbed. But the second company was no more successful than the first; and when in 1902 it united with the Corn Products Company (the glucose trust) it was on the " verge of bankruptcy." [2]

The United States Leather Company (the sole leather trust) was formed in 1893. The vice-president of the company testified that prior to its organization the tanners kept their plants running whether there was any money in it or not; and that in 1892 there " seemed " to be an overproduction of sole leather.[3] This temporary condition does not, of course, necessarily indicate a state

[1] Industrial Commission, vol. xiii, p. 672.

[2] Dewing, op. cit., p. 93.

[3] Industrial Commission, vol. xiii, pp. 685, 687. Dewing, op. cit., p. 18, states that in 1892 there were " signs of marked overproduction."

of "ruinous competition." At any rate the formation of the trust does not appear to have brought relief. As Mr. Dewing points out, this industry is one in which the economic conditions do not favor even large scale production, let alone combination. The necessary investment in plant is small, and both the raw material and the finished product are handled under highly competitive conditions. The result was that the price of leather continued to be fixed upon as competitive a basis as before the formation of the company,[1] and net profits up to 1901 were no greater.[2] Of recent years the Central Leather Company, which succeeded to the property of the original company, has been prosperous, tho it has been subject to keen competition.

The National Salt Company (which effected monopoly control shortly after its formation) was incorporated in 1899. Its president alleged that it was organized by the manufacturers for their self-preservation; that competition in many sections was "intense and vicious," affecting not only prices but quality.[3] In some cases sales were made below cost. However, by these remarks the witness did not mean to say that there was no profit to be made in the business. Properties that were well located, well managed and producing a superior grade of goods made money; the others did not. His own company for three years prior to its sale to the National Salt Company averaged 20 per cent every year, but this was a very well-located property.[4] As Mr. Dewing has pointed out a very large part of the cost of producing salt is represented by interest on the cost of sinking a well; and therefore frequently it is nearly as economical to operate at a loss as to close the plant.[5]

[1] Dewing, op. cit., p. 25.
[2] Industrial Commission, vol. xiii, p. 687.
[3] Ibid., p. 253.
[4] Ibid., p. 256.
[5] The ratio of capital to annual value of products is high in the salt industry. See p. 486.

It was therefore believed that consolidation in this industry would prove particularly advantageous, the more so since the demand for salt is highly inelastic.

Fortunately or unfortunately it did not work out in this fashion. The supply of salt is practically unlimited, and the trust found it impossible to maintain the price. It suffered heavy losses on the salt that it bought as a means of sustaining the market. Within three years of its formation the company went bankrupt. The property was sold at public auction; and the company dissolved. Its business passed over to the International Salt Company, which sold much of the property, and now confines itself largely to the New York field. Even it has not been prosperous, and its president has conceded that competition in this industry "will always prevail." [1]

The Asphalt Company of America (the asphalt trust) was formed in 1899. The principal reason for its organization was said to be "the desire to diminish the severity of competition." [2] However, it was conceded that the principal companies were able to make a profit; the fear was that a condition was approaching in which prices would be cut to cost or even below cost.[3] Certainly the leading concern, the Barber Asphalt Paving Company, had been very prosperous, even through the depression of the middle nineties.[4] The head of this concern seems to have been opposed to the organization of a trust; apparently he did not regard the situation as hopeless. The combination fever was in the air, however, and he was overruled. Unfortunately for the future success of the trust it was overloaded with bonds. New competition soon appeared at every point, and the company

[1] Commercial and Financial Chronicle, vol. 88, p. 1311.

[2] Industrial Commission, vol. xiii, p. 678.

[3] Ibid.

[4] Dewing, op. cit., pp. 414, 415.

found itself unable to meet its obligations. Toward the close of 1901 — less than three years after its incorporation — it passed into receivers' hands. In the reorganization its entire assets were acquired by the General Asphalt Company.

A final group of industries is that in which no trust has ever been established, and in which, therefore, there is a strong presumption that competition, tho it continually eliminates the inefficient concerns, is in no sense ruinous to the industry. These industries, to cite but a few, include the following: automobiles; shoes; soft coal; cotton goods (not including cotton yarn and cotton duck); woolen and worsted goods; silk manufactures; men's and women's suits; cigars; soap; flour; and hats.

The foregoing analysis — theoretical, statistical, and descriptive — would appear to justify the conclusion that competition in manufacturing industry is not definitively ruinous. The statistical basis is not fully adequate — there is an excellent opportunity here for constructive work on the part of the Federal Trade Commission; nevertheless such data as are available point to marked differences between the railroad industry, in which competition does tend to become ruinous, and manufacturing industries. Theoretical analysis likewise brings out these differences; it appears that the factors that tend to make railroad competition ruinous are not present to anything like the same degree in the case of manufacturing enterprises. Finally, a study of individual industries, particularly those in which trusts have been formed, establishes that the competitive returns on the whole were adequate and that the formation of trusts was seldom necessitated by the severity of competition.

Tho competition is not generally ruinous in industry, yet there may be particular industries in which it does lead to disaster. The iron and steel industry and the anthracite coal industry perhaps fall within this group. However, the conclusion as to these two businesses must be regarded as tentative; it is intended here merely to stress the importance of specific analysis, and to suggest a method of approach to the problem.

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REVIEWS

HAWTREY, CURRENCY AND CREDIT; FISHER, STABILIZING THE DOLLAR[1]

MR. HAWTREY'S book is an important contribution to monetary theory. No small part of its quality lies in its method, for Mr. Hawtrey has undertaken to analyze and explain step by step the actual processes by which credit is expanded and contracted and by which general changes in the price level are effected. While avoiding any parade of erudition he shows knowledge and appreciative understanding of the established body of monetary theory. There is no attempt to emphasize or exploit his own points of difference with generally received doctrines, altho such points of difference are by no means negligible. In short, Mr. Hawtrey's book is painstaking and sincere, as well as competent.

If the book gains neither the readers nor the influence it deserves it will be because Mr. Hawtrey is not a good expositor. His style is unpretentious, straightforward, and generally lucid. But the organization of his argument leaves much to be desired. The reader has to toil through one long and closely-printed paragraph after another, uncertain always whether he is on the threshold of a new turn in the discussion, of a more detailed analysis of a point that has just been presented, of an important qualification of some general and sweeping statement, or of a succinct summary of the stage the argument has reached. Few books with equal claim to be read make equal demands upon the patience of the reader. Mr. Hawtrey owes it to himself as well as to his

[1] Currency and Credit. By R. G. Hawtrey. London, Longmans, Green & Co., 1919.
Stabilising the Dollar. By Irving Fisher. New York, The Macmillan Co., 1920.

readers to put some sort of articulation into the argument of his next book.

Turning to matters of substance, Mr. Hawtrey breaks with precedent by making gold subordinate to credit. Credit, that is, is held not to be merely a substitute for gold or even a superstructure erected on a gold foundation. In respect of its monetary functions it is assigned a position of priority, while gold is pictured as functioning as an anchor, or better, perhaps, as a kind of gyroscopic stabilizer of the credit system, setting up stresses that force a contraction of the credit system after expansion has gone to a certain point. This view of things helps to give an air of reality to Mr. Hawtrey's account of the processes of the money market, but I do not see that it materially affects his conclusions. They are what they would have been if he had chosen to invert the order of functional, or logical, priority as between gold and credit.

But putting credit into the foreground makes it easier for Mr. Hawtrey to give the emphasis he desires to the concept of the *money of account*. Transferable or assignable credits (Mr. Hawtrey prefers to call them debts) against solvent debtors have purchasing power. Conceivably, perhaps, each credit might be merely a right to receive a certain amount of a particular commodity; different credits might run in terms of different commodities; and exchange, tho easily seen not to be very far removed from barter, might nevertheless be carried on by means of credit instruments. But in fact a unit for the measurements of credit "is indispensable." This is the money of account. Prices, too, are stated in terms of the money of account, for every sale creates a credit, even where the credit is immediately extinguished by a money payment.

With Mr. Hawtrey's nominalistic views, such as that even where there is no money in circulation a money of account, "something wholly conventional and arbitrary," is possible, I cannot agree. Nor do I believe that it can even "occasionally happen" that the unit of the money of account and the unit of the money in circulation do not correspond. For credits are nothing but rights to receive stipulated amounts of the (legal tender) money of circulation, and are of necessity

expressed in the same unit. There may be a difference in name (as between shillings and dollars in the American colonies), but in such cases the unit of the money of account is in fact merely a fraction or a multiple of the unit of the money of circulation.

But even if a money of account, disassociated from a money of circulation, were possible, it is probable that Mr. Hawtrey is right in thinking that it would lack stability, that an expansion or contraction of credit, once initiated, along with the accompanying upward or downward movement of prices, would tend to continue in a cumulative way, without an effective limit. An expansion of credit would create a higher price level and the higher price level would make possible and even necessary a further expansion of credit. Under favorable conditions this process of reciprocal response might perpetuate itself indefinitely.

Under actual conditions, where the money of account is identified with the money of circulation, it is of course the relative inelasticity of the supply of legal tender, and especially of gold, revealing itself in a growing pressure upon bank reserves, that sets a limit to the expansion of credit and the rise of prices. Mr. Hawtrey's account of the ordinary succession of events in a period of expansion is possibly his most substantial achievement. In particular his analysis of the respective parts played by manufacturers, merchants, and consumers is enlightening and for the most part persuasive.

But I am not sure that Mr. Hawtrey is altogether successful in his attempt to derive from his analysis of the expansion of credit a set of new concepts — "consumers' income," "consumers' outlay," "the unspent margin" — and to formulate his general theory in terms of those concepts. His account of the process is lucid and realistic; his attempt to explain the process in abstract and general terms is obscure and seemingly somewhat confused.

His purpose, however, is laudable. He is not satisfied with the conventional formulations of the quantity theory, and the "equation of exchange," however valid, does not seem to him to have much significance. This is partly because Mr.

Hawtrey is less interested in imagined states of monetary equilibrium than in what Professor Irving Fisher would call "transition periods," for these latter seem to Mr. Hawtrey, as to many others, to hold the stage most of the time, and to include the monetary phenomena most worthy of careful study. Moreover, Mr. Hawtrey holds that two of the magnitudes which enter into the equation of exchange — the volume of trade and the rapidity of circulation of money and credit — are not themselves of separate importance.

> In the aggregate of transactions the gross total of business transactions, where goods or securities are bought in order to be sold again, will count for enormously more than the expenditure of the private individual. . . . The turnover of the trader may be many times greater than his income, and his bank balance is far smaller in proportion to his turnover. . . . The traders' turnover counts for far more in the total than its actual share in determining the quantity of purchasing power in circulation would justify, and its amount is affected by capricious and uncertain factors. And the rapidity of circulation of money or credit is not a phenomenon which enters directly into any one's experience. . . . If any circumstances affect the rapidity of circulation of money it can only be indirectly, by affecting balances. (Pp. 47, 48.)

There is much force in this criticism. The equation of exchange does not carry one very far into monetary theory. Perhaps a more significant general statement of the relation between money and the price level is possible. Mr. Hawtrey himself proffers an alternative formulation. If I understand it, and I am not sure that I do (the reader may prefer to consult Mr. Hawtrey's book, at pages 34 and 164), it amounts to nothing more than the statement that what he calls the "unspent margin," i. e., the money in circulation plus the bank credits outstanding, is measured as a sum or *quantity* in the units in which prices are stated. Any change in the magnitude of the unit will be accompanied by an inversely proportional change both in the number or "quantity" of units and in prices.

Just what does this mean and how significant is it? Make the dime instead of the dollar the monetary unit, and prices and the number of monetary units will be increased tenfold.

Is this a change in the "quantity" of money? Not everyone will agree that cutting down the weight of the monetary unit from 25.8 grains to 2.58 grains would be properly interpreted as a tenfold increase in the quantity of money. Quantity depends, some will say, upon the magnitude of the unit as well as upon the number of units. But Mr. Hawtrey's quantity theory is not wholly disposed of by such considerations. If, beside credit instruments, there were no money save Mr. Hawtrey's hypothetical money of account, the monetary unit would have no magnitude except a value magnitude, expressed by its relations to commodities and services in general, that is (inversely) by prices. The quantity of money would be merely the sum of the money units in the credit instruments outstanding. This could be interpreted only as (1) an abstract number or (2) a sum of purchasing power. Purchasing power being inversely proportional to prices, the quantity of money would be more or less according as prices were higher or lower. The quantity theory, in fact, would be wholly contained within the phrase "quantity of money." In these respects an inconvertible paper currency, wholly divorced from a commodity standard of value, does not differ from a money of account. Its quantity *is* its value, or else is a mere number. Most of the expounders of the quantity theory, I suppose, would be content to define quantity in this case as mere number. If so, must not the change from dollars to dimes be held to be an increase in the quantity of money?

But the significant problem, as Mr. Hawtrey fully realizes, is of the effect of an initial change in the number of monetary units rather than in the magnitude of the monetary unit. For this problem, he confesses, his formulation of the quantity theory is inadequate. It is here that he has recourse to the acute analysis and the awkward exposition to which I have referred above. In large measure this part of the discussion is a development and a more rigorous treatment of points made in Mr. Hawtrey's earlier book on *Good and Bad Trade*. (For the general reader the earlier book may be more safely recommended than the present work.) It is impossible here to follow into all of the intricacies of Mr. Hawtrey's analysis. Its general outlines only can be indicated.

An increase in bank credit in the form of advances to manufacturers and merchants is paid out in the form of the expenses (and profits) of production and distribution and becomes "consumers' income." If purchases ("consumers' outlay") just keep pace with the increase in consumers' income they will enable the dealers to take up their obligations as they mature, altho they will have to give new orders, leading to fresh creations of bank credit, to replenish their depleted stocks. If outlay lags behind income, consumers' balances of money and credit (the "unspent margin") will increase. The more rapidly the unspent margin increases the *slower* will be the advance of prices. A rise of prices results from the use of purchasing power, not from its accumulation.

During a period of depression a considerable acceleration of the rate at which credit is created is possible without an accompanying rise in prices. But sooner or later the increase of credit, i. e., of purchasing power, presses against the productive resources of the country, and prices rise. The increasing price level on the one hand, and the supply and demand of credit on the other, react on each other with cumulative effect. Under ordinary conditions there is no halting the process until bank reserves become inadequate and discount rates have to be raised. Even then some further inflation is latent in the situation, for producers have unfilled orders on their books. And bank reserves are likely to be further depleted: wages have very likely not reached their peak, and for this and other reasons less money has been drawn into hand-to-hand circulation than the high price level would justify.

With some relatively unimportant qualifications I can accept this as an outline of the general mechanism of a period of credit expansion. I cannot see, however, that the "unspent margin" is properly a part of the explanation, except so far as it enables Mr. Hawtrey to give a paradoxical twist to the quantity theory. I even doubt the truth of the paradox. The more rapidly consumers spend their incomes, the more rapidly, in general, will fresh orders by dealers lead to the creation of new credit, and the more rapidly will "consumers' income" be augmented. The unspent margin (a misleading

phrase) is likely to be replenished in a period of rising prices more rapidly than it is depleted. On these and on other matters Mr. Hawtrey might either have brought himself to revise his own opinions or have removed the doubts of his readers if he had tested and controlled his conclusions by the use of statistics.

In some of its details Mr. Hawtrey's account is, as might be expected, a more accurate interpretation of English than of American conditions. He is preoccupied with the monetary side of manufacturing and trading occupations and gives little attention to those variations in farmers' incomes which play so important a part in the fluctuations of the American money market. Again, his general statement that credit expands and prices advance until an adverse movement of the foreign exchanges gives the first signal of danger to bank reserves does not hold, unless many exceptions are made, for pre-war conditions in the United States. His discussion of the process by which credit is contracted, altho not neglecting the problems of countries which do not "finance their own exports or imports," is primarily concerned with the pre-war mechanism of the London money market.

I have selected for comment those portions of Mr. Hawtrey's book which have the best claim to be called contributions to monetary theory and to which he himself attaches most importance. In his accounts of international currency movements, of coinage problems, of the relation of war finance to inflation, and of the general theory of banking operations, American economists will find fresh points of view, but little of large significance that is wholly new. There will be dissent, no doubt, at minor points, such, for example, as Mr. Hawtrey's thesis that the adequacy of bank reserves is a matter of their absolute amount rather than of their ratio to bank liabilities. There are some remarkably fresh, interesting, and well-informed chapters on such well-worn topics as the assignats, the Bank restriction of 1797, and the history of the gold standard.

On the largest monetary problems of the day — deflation and the future of the gold standard — Mr. Hawtrey, like any

writer who knows the magnitude of the unknown factors in the situation, is inconclusive. Two observations, however, are worth quoting: "Deflation and capital restoration, notwithstanding that taxation and other severe financial methods favor both, must be regarded as in some degree rivals. Purchasing power which is applied to the one is diverted from the other. The problems of the finance of recuperation are largely the consequence of this rivalry." And again: "During the war, wages have everywhere been increased in a very high proportion. It seems not unlikely that the difficulty of reducing them again will be the determining factor in the settlement of the future monetary units."

Professor Fisher's new book does not call, as a whole, for extended comment. Economists are familiar with Professor Fisher's plan for varying the amount of gold in the monetary unit in accordance with the showings of an officially-kept index number of prices. It has been critically discussed in this and other journals. Undoubtedly it has won for itself an increasing measure of support. Possibly Professor Fisher does not go too far when he says in his preface, "By this time [1918] academic economists had been largely won over to the idea, it having run the gantlet of their criticism for several years." My own impression, however, is rather that the general attitude of competent academic opinion could be more accurately described as open-minded, receptive, in some measure acquiescent, but nevertheless doubtful and even skeptical with respect to the practical feasibility of the plan.

This noncommittal attitude cannot fairly be explained as an instance of the hesitancy sometimes supposed to characterize the academic scholar. There are many who would be glad to see the experiment made who remain doubtful as to its outcome. The fact is that the repercussions of the stabilizing operations upon banking, upon foreign trade, and upon business enterprise and industrial progress in general, are exceedingly complex matters. They need more accurate and more thorogoing analysis than they have yet received. Professor Fisher's unusual power of broad and yet precise generalization leads him sometimes to oversimplify his problems.

The body of the book is made up of propaganda addressed to the general reader. There is an elementary explanation of the scheme and of the evils which it is designed to cure. Pains are taken to anticipate different sorts of misunderstandings and adverse arguments. All this, as one expects of Professor Fisher, is carefully arranged and lucidly presented. He has done well, for example, to plot all of his diagrams on a logarithmic vertical scale. The point of interest, of course, is the relative rather than the absolute change in the price level.

Economists will have more interest in the several appendices in which Professor Fisher develops the technical details of his plan. From among a number of specific proposals that invite comment I select two which seem to me to have an important relation to the general principles upon which the whole scheme rests. These topics are the management of the gold reserves and the structure of the index number.

The problem of the maintenance of adequate gold reserves back of the "gold bullion dollar certificates" has many perplexing features. If prices tend to increase, the outstanding certificates will, under the stabilization plan, be redeemable in increasing amounts of gold. The reserves might easily become less than a 100 per cent cover for the certificates. When prices tendencies are downward surplus reserves will be accumulated. If the reserves were allowed to fluctuate freely in this manner there is a possibility that in the long run surpluses might balance deficits, but there is also a possibility that the reserves might be exhausted, or reduced to a point where confidence in them would be lost. But, as Professor Fisher suggests, the reserves might be kept at 100 per cent by withdrawing certificates from circulation or by issuing additional certificates at the expense or to the profit of the government. This contraction or expansion of the currency, it is clear, would augment the effect on prices of the last previous correction in the mint price of gold.

The plan Professor Fisher prefers, however, is to fix the legal reserve at 50 per cent of the certificates outstanding (in which case they should be called notes) and to regard gold accumulations in excess of the amount so determined as

"surplus." The surplus, he suggests, might be used to purchase government bonds, which could be sold and the certificates thus obtained retired, if at any time the reserve should become impaired. The initial operation of exchanging gold for bonds would in some measure defeat its own purpose, for it would cheapen gold, raise prices, decrease the redemption price of gold at the mint, bring the reserve down below the 50 per cent line, and necessitate the sale of bonds. I do not agree with Professor Fisher that the effects of these gold sales upon the price level might be offset by the diminution of the supply of bonds available for collateral at the banks. The problem is too complicated to be discussed in a review, but it obviously hinges upon the degree of elasticity of the market for gold, as well as upon the extent to which, at the time, government bonds are themselves carried by bank loans.

"This system," says Professor Fisher, "would recognize the needless waste involved in a 100 per cent, or other high reserve." I fear that Professor Fisher is here giving currency to a fallacy which one encounters only too frequently, especially in discussions of the advantages of the gold-exchange standard. In the long run there is no real economy in reducing gold reserves, except as the industrial demands for gold are more easily met and, at the same time, gold mining repressed. Economies of this sort are not what Professor Fisher has in mind, for, as we have just seen, he does not believe that a reduction of the gold reserve need be accompanied by a fall in the value of gold.

One of the objections made to Professor Fisher's plan, in its original form, was that the ordinary index number of the general price level covers a multitude of commodities whose price movements are relatively sluggish. Just as changes in retail prices usually lag behind changes in wholesale prices, so wholesale prices themselves are of different degrees of responsiveness to changing monetary conditions. There is a chance, therefore, that the movements of the index number, held back by these relatively sluggish and unresponsive commodities, might indicate that the mint price of gold should, for example, be decreased, even tho earlier corrections

had already initiated a downward movement in prices, undetected as yet by the index number. It was accordingly suggested that a selective rather than a general index number should be used.

Professor Fisher has now constructed an index number based on 155 series of price quotations, covering 75 especially sensitive commodities. It shows as between 1913 and July, 1919, a rise of 130 per cent as against 116 per cent shown by the Bureau of Labor Statistics index number of wholesale prices, and this comparison falls short of revealing its superior sensitiveness. It lags behind changes in the amount of money in circulation, Professor Fisher thinks, by about a month.

The use of a special index number of this type narrows the commodity basis with reference to which changes in the value of money are to be determined. It will not meet with the approval of those critics of Professor Fisher's plan who believe it should not be based upon wholesale prices alone, but that retail prices, rents, wages, and possibly other items should be taken into account. The index number, in the view of such critics, should be one on which a just standard of deferred payments might be based. The old controversies about "commodity standards," "utility standards," and "labor standards" have seemed likely to be revived in some of their discussions.

These critics, of course, miss the whole point of Professor Fisher's proposals. His index number is not and should not be the type of index number which would indicate the degree to which debts might justly be scaled up or down. It is merely part of a mechanism which, if successful, would not so much afford in itself a just standard of deferred payments as do away with that problem altogether. For this purpose there can be small doubt that a selective index number, based on the wholesale prices of commodities that are particularly responsive to monetary influences, is best.

The most significant thing about Professor Fisher's index number is that it is made up very largely of important imported commodities, together with commodities which figure largely in our exports and goods into which imported or ex-

portable commodities enter as raw materials. This fact is closely connected with a point which, more than anything else, has made me doubtful of the practicability of a purely national undertaking to stabilize the dollar.

Assume, for example, that new supplies of gold are pressing prices upward. Domestic prices are held down by decreasing the mint price of gold. Not all prices will be simultaneously affected by this operation. For some commodities the diminution in price or the retardation of the upward movement will come slowly and, to producers and consumers alike, imperceptibly. But goods for which the market is international will be affected at once. Their domestic prices will drop relatively to their prices in foreign markets by an amount which will just correspond to the fall in the price of foreign exchange, which in turn will correspond to the decrease in the mint price of gold. Where the foreign market is of dominating importance the drop in the domestic price of imported or exportable goods may in itself be equal to the amount of "correction" applied to the dollar, and this is likely to be the initial effect in most cases.

During a year in which the mint price of gold is reduced at each of a number of successive periods, the decline in the prices of the commodities which have an international market, relative to the more slowly-moving prices of other goods, may be considerable. Importers will gain as exporters lose; and, of course, when the general tendency of prices is in the other direction their relative positions will be reversed. But I am very doubtful whether a decline of even a few cents a pound in the price of cotton, directly attributable to the action of the government, in a period when many commodities may be increasing in price, would be viewed with equanimity by cotton growers. I should expect that such things as this would make the plan politically unpopular, and hence impracticable.

At any rate I do not believe that Professor Fisher will gain much support among economists for his proposal that the present high level of prices should be stabilized. That high level is supported by credit expansion at home, but also in part by credit expansion in Europe. A general collapse of the

European credit structure, with enforced liquidation, might easily drain so much gold from us that our price level could be maintained only by transforming our "bullion certificates" into inconvertible notes. I am not sure that Professor Fisher would object to this. In this book he puts more emphasis than before upon the control of prices by the control of the number of certificates in circulation and less upon the direct effect of changing the amount of gold in the monetary unit.

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USHER, INTRODUCTION TO THE INDUSTRIAL HISTORY OF ENGLAND[1]

IT is a trite saying that the Holy Roman Empire was not holy, not Roman, and not an empire. And so with the scholarly book under review: it is too advanced to be called an Introduction; it is not strictly confined to industrial history; and it is not exclusively concerned with England. Two long chapters deal with manufacture outside of England, in the ancient world and in medieval France. In a book on the general history of industry, such studies would be necessary; but since there is no proved connection between the industry of the ancient period and of medieval France on the one hand and English industry on the other, some may question whether the author is justified in going so far afield. The subject of English history is introduced, not by a chapter on Anglo-Saxon industry but by one on "The Population of England, 1086–1700." Then follows a chapter on the "Village and Manor," satisfactory in itself but not made contributory to the general theme of industrial history. Thirty

[1] An Introduction to the Industrial History of England. By A. P. Usher, Assistant Professor of Economics, Cornell University. Houghton Mifflin Co., 1920. Pp. xix, 529. $2.50.

pages on town trade carry us further in the latter field. We get nearer to English industry in the eighth chapter, "The Development of Gilds in England"; but it is not until two-fifths of the space have been used that we arrive at manufacture in the narrow sense, in a chapter on "The Woolen Industries, 1450–1750." At this point we think that we are under way, but the next chapter sidetracks us onto "The Enclosure Movement and Land Reform." There would be ample excuse for treating such a subject if it was closely correlated by the author with industrial development, but this he does not do. At the middle of the book the industrial revolution is introduced and presented in an informing, tho not novel, way. One cannot but feel that it is the economist, and not the historian, who is writing the history of English industry, when stress is put on early industry and then on the industrial revolution without adequate treatment of the significant intervening period. After the chapters on the industrial revolution comes the subject of labor and capital. The two chapters on railways might be made significant for the study of English industry if transportation had been related to progress in industry. Indeed this is a serious criticism of the whole book: the parts, good in themselves, are not combined to form a connected story.

We may pick out three propositions of general significance. The first is that from at least the days of the historic fairs and of the commercial towns of the Middle Ages, there has been a duality in commerce; not a local trade followed by a wider trade, but local and "cosmopolitan" trade existing side by side, one the counterpart of the other. Let us hope that this is the last lance that it will be necessary to break against the persistent misconceptions of the German historical economists, that a local and more or less closed trade was followed by a national and an international trade.

The second general proposition, explicitly called the "thesis" of the book, is that "commerce is the conditioning factor in industrial development" (p. 39). This is so widely accepted that it needs no comment, provided by "commerce" we mean, not a primary cause but a resultant of many factors

working themselves out in the exchange of goods and services. It is questionable whether the thesis is adequately maintained in the present book. Three causes of the industrial revolution are set forth: mechanical achievement, commercial changes, and physiographic factors. It is probable that in all economic history there is no clearer illustration of the influence of the market upon industrial development than in the industrial revolution. It seems to the reviewer that the author in justice to his own central theme should have dealt at length with the question why the industrial revolution began in England and not in France or elsewhere. England's commerce was in staples; France's in luxuries. England's markets were extended in Canada and India at the expense of France. And when Napoleon sought to capture the world, England captured the world's markets. Perhaps the author thought all this too obvious for emphasis. In a valuable, tho immature, chapter on the East India Company, the author shows how England's commerce affected England's industry. The East India Company imported Indian cottons to the detriment of English woolens and silk goods. Having acquired a taste for cottons, Englishmen set about to manufacture their own supply. In doing this the industrial revolution was started; the relatively cheap English machines — we may so state it — could compete with the relatively cheap Indian laborers. English capital, in other words, triumphed over Indian labor.

The third proposition is that industrial development can best be studied in its progression from one form to another. The author accepts Bücher's stages: household industry, wage work, handicraft (" craft work "), commission (" putting-out ") system, and factory system. If English industry had been carefully traced through these stages and illustrated by facts and examples, our gratitude to the author would be considerable. Instead, he prefers to comment briefly on each, and then to deal at length with the last only. But the comment is to the point and instructive. Following the lead of Unwin, the author is inclined to restrict the scope of the handicraft system: "pure craft-work could not long main-

tain itself" (p. 217). In other words, very early in both town and country, one handicraftsman came to work for another who became the capitalist industrial employer, the organizer of the putting-out system. Even tho the organization of the industry had changed, the form of gild association remained outwardly the same. Hence the seriousness of the common error of calling the handicraft the "gild system."

In the putting-out system we have an industrial entrepreneur controlling manufacture. If he lived in a town, he was a member of a gild or livery company, if in the country he belonged to no association at all. In accepting this stage the author has followed German practice into difficulty and into error. For instance, he tells us of the yarn-spinners of Wiltshire, Gloucestershire, and Somersetshire, buying their own wool on the market and selling it to clothiers. These spinners he places in the putting-out system in spite of the fact that the original document specifically says that they "will not spin to the clothier for small wages." In other words nothing was put out or loaned, neither wool nor tools, neither food nor house. The workers were independent. If the author had sufficiently weighted this western English form of industry, and if he had made a study of the Yorkshire textile industry, he would have discovered that between the handicraft and the putting-out forms there is an intervening stage. Cunningham, following English practice, called this stage "domestic industry."

What is a factory? Lawyers, economists, and historians have disagreed. Usher makes it a matter of discipline and division of labor. In the absence of any accepted view, to dissent seems to involve little more than the expression of one's own opinion. If a stage intervening between the putting-out and the factory system were allowed for, some of the difficulties would be solved. Perhaps we should call the form of industry by which both discipline and the division of labor were developed the central workshop. We find it coming into being in the early modern period in Jack of Newbury's textile establishment with its 1000 (?) workers; in the Gobelin workshop; in the pottery of Meissen with its hundreds of work-

men; and in the eighteenth century silk mills of England. Later, power machinery came in, and to regularity of output and standardization of methods was added large-scale production, which is normally taken to be the mark of the factory.

Remembering the author's main thesis, that commerce conditions industry, we should expect to find each stage treated in the light of commerce, and each progressive move in industry linked with commercial changes. Wherever this is done, it is done effectively. But so much attention is given to secondary industrial phenomena and to manufacturing technique that little space is left for the main theme.

The industrial revolution is treated as a matter of the steady growth of capitalism in industry. It may be divided into phases: textile inventions, conception, struggle, achievement, climax, and conclusion (1914). To extend the industrial revolution over a period of two hundred (1700–1914) years makes it evolutionary, not revolutionary. Numerous have been the conceptions of the industrial revolution. Whatever else it was, the reviewer conceives it as a movement involving revolutionary changes and far-reaching results. As a movement it came to an end when another dominating movement came along. This was the revolution in transportation, begun by canal building (omitted by the author), and continued by the construction of railroads and the invention and perfecting of steamboats.

The recognition of old stages of industry, rather than the discovery of new ones, is obviously one of the main contributions of the book. Gradually in England and America, under the lead of Germany, the genetic viewpoint is gaining ground. Useful as Usher finds stages, and valuable as the genetic point of view is to him, he is nonetheless at all times consciously striving to master the stages and not to let them master him, to subordinate the genesis of industry, as he conceives it, to the history of industry as he finds it recorded in the sources. This distinction between genesis and history is further brought out by his preference for the word "form" rather than "stage."

A dominant note in this book is the recognition of the difficulty of writing it. Interpretation is " dangerous " (p. 135), the gild system is fraught with " obscurities and complexities " (p. 165), and the merchant gild " presents a most complex array of problems " (p. 171). The reiteration of such statements gives the impression of the hypercritical. To the maturer student this is perhaps salutary. But to the novice in economic history it is dangerous; and for the novice this book was written — for " an elementary class," for " college classes beginning work in economic history." As collateral reading, the book will be of value for college upper classes. But it hardly has a place as a text-book. The author in introducing a subject first presents the critical aspects of the matter at hand, then explains it. If the student survived this introduction, he would profit by what follows.

A fault that may be due to publisher rather than author, is the practice of putting in the text matter that clearly belongs to notes. The specialist will probably not be so much concerned with this, however, as with the absence of specific references on illustrations and questionable points to which he may wish to give attention. The selected list of books for further study will prove of great service to the advanced student. Yet it is difficult to account for some omissions, for example, why the tomb of Rekhmara is listed for study and not those of Beni Hasan, and why Gonner's work on the enclosures is recommended while nothing is said about Tawney's *Agrarian Problem*.

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NOTES AND MEMORANDA

THE STOCK CLEARING CORPORATION

THE present Clearing House of the New York Stock Exchange has been in operation since 1892. Only the more active stocks dealt in on the Exchange are cleared, and not all Stock Exchange firms, even among those with New York offices, are members of the Clearing House; certain firms clear through others. The institution has been of invaluable service in reducing the daily turnover of money in New York, and it is safe to say that without it the New York money market could not handle stock exchange transactions on anything like the present scale.

A brief word may be said in review of the essentials of the existing mechanism of stock settlements. As is well known, ordinary purchases and sales are made to be delivered the next day between 10 A.M. and 2.15 P.M., either through the Clearing House or "ex-Clearing House." All transactions in stocks on the Clearing House list, in 100-share lots or multiples thereof, which take place between member firms that belong to the Clearing House, must be put through that institution. Members exchange clearing house tickets on the day trades are made, and before 5 P.M. the same day all clearing house tickets and sheets must be delivered to the Clearing House. The next morning balance tickets are secured, and from these tickets firms know from whom they are to receive or to whom they must deliver the net amounts of the cleared stocks that they have bought and sold.

Each day a vast amount of money is "swung" in Wall Street. The present Stock Exchange Clearing House greatly reduces the swing, but of necessity much remains. A firm, let us say, buys $5,000,000 worth of stocks on balance. To pay

for these it must borrow that much or almost that much money. It cannot borrow the money without pledging collateral in the form of securities, and, aside from what securities it has on hand, it cannot get the securities to pledge for its borrowings without paying for them. Or a firm may buy several million dollars' worth of certain stocks and sell an equal amount of other stocks, which would again necessitate a large swing of money, even tho it did not require any borrowing operations. And in either case, the firm would need temporary assistance from its bank in the form of certification privileges.

Professor Sprague's monograph on the *History of Crises under the National Banking System* shows what an important place the subject of overcertification of checks in New York, in connection with stock exchange operations, had in discussions of the New York banking situation, following the panics of 1873 and 1884. Before the panic of 1893 broke, the Stock Exchange Clearing House had been established and a great measure of relief afforded. Yet the practice of overcertification had continued, and virtually continues still in the form of "day loans," granted in the morning and made good before the end of the day. It is these loans which make possible the daily swinging of money and securities that goes on, within a few hours, on such a large scale, every full business day.

It is worthy of note that at least as far back as the early eighties, there were suggestions for a "stock clearing house to enable the brokers to make their settlements without calling upon the banks to certify their checks for the purpose of clearing their stocks."[1] The Stock Exchange Clearing House as established in 1892 did not accomplish this. It is just that which the present Stock Clearing Corporation aims to do, to a considerable extent.

There are at least two factors which have finally brought about the establishment of the institution at this time, or at any rate made its establishment more than ever desirable. One is the very great increase in the number of stocks dealt in

[1] Sprague, op. cit., p. 358. See also ibid., pp. 379, 384.

on the Exchange and the greater diversity of interest in the trading. A dozen years ago, four stocks, two industrials and two rails, were the acknowledged leaders on the Board: United States Steel common, Amalgamated Copper, Reading common, and Union Pacific common. Today only Steel, of these four, could fairly be classed as a leader, and Amalgamated is no more. Motors, oils, sugars, and from time to time other specialties divide the major part of the interest and the trading volume among themselves. As a result, there is a smaller ratio of offsets effected by clearing operations, a smaller ratio of saving in money turnover, than was the case when a small number of leading stocks made up a large part of the trading. The day this is written, for example, April 17, it takes a column and a half of a newspaper to list the stocks, one on a line, that were traded in on a Saturday, in a two-hour session, with total sales of 450,000 shares; and there are sales of seventeen times as many shares of American Safety Razor stock as of Union Pacific. The second factor making the Stock Clearing Corporation highly desirable is the overburdened condition of the money market and the great eagerness of the banks to cut to the minimum the amounts of accommodation granted in the form of day loans.

The Stock Clearing Corporation, which expects to begin operations about May 1, succeeds the Clearing House of the New York Stock Exchange, which will henceforth be known as the Night Clearing Branch of the Corporation. It is incorporated under the laws of New York and has a capital of $500,000, all of it owned by the New York Stock Exchange. All the new functions of the corporation will be performed by the Day Clearing Branch.

For the present the Day Branch will limit its operations to clearing security balances. It expects later to clear loans also. Each morning, not later than ten o'clock, clearing members will bring to the Day Branch itemized lists of their balances of securities to be received from and delivered to other firms, lists made up from balance slips secured from the Night Branch. Then through the day they will make and receive deliveries of cleared securities, without money payments,

taking and giving receipts only. Deliveries will be, as now, between members, not to the Clearing Corporation, but carbon copies of receipts will be delivered to the Corporation, to serve as a credit there to the account of the delivering member and a corresponding debit to the receiving member. Deliveries must be completed by 2.15 P.M., and between 2.30 and 3.00 P.M., members must deliver checks to the Corporation for their net debit balances for the day, or receive from the latter a draft to the amount of the net credit they have established there, as the case may be. For example, if 1000 shares of Union Pacific were delivered at 119, and 1000 shares of Steel common received at 105, the firm putting these through would be entitled at the end of the day to receive from the Corporation a draft for $14,000, the difference between $119,000 and $105,000.

The Corporation will be prepared to grant to clearing members accommodation similar in essence to the banks' day loans, which will assist them to finance operations during the day. This will be the case, however, only after the clearing of loans has been instituted, and in connection therewith; meanwhile day loans will, as now, be secured from banks. Each of the New York banks and banking houses which lends money on the Street, and which is approved by the Corporation, will then have a representative at the office of the Corporation during the day, prepared to receive or deliver collateral, in making or paying off loans or in substitutions of collateral. When loans are made or paid off, securities are to be delivered by the borrowers or the lenders, respectively, to the Corporation, which will credit or debit the amounts involved to the accounts of the clearing members, and will receive from the lenders the proceeds of a new loan or pay the amounts necessary to meet old loans that are being paid off. In case a loan is paid off, and a clearing member wishes to use some of the securities thereby released, to make a delivery on a security balance, he may receive them, provided he promptly makes the delivery and returns to the Corporation the signed receipt of the clearing member to whom delivery has been made. Or he may obtain certain securities, for any

purpose he wishes, by temporarily pledging other satisfactory securities in their place, until accounts are settled at the end of the day.

There are sundry complications that need not be gone into. The essence of the matter is that, so far as Clearing House transactions go, no money will have to pass between Stock Exchange clearing firms — or between these firms and banks, when loans are cleared — and that at the end of the day each clearing member will receive or pay one check covering the net balance on all his clearances.

Two essential elements of the plan have yet to be mentioned, tho they have already suggested themselves to the reader. The first is, Whence do the funds at the command of the Corporation come? The second is, What is the Corporation's authority over the securities belonging to clearing members?

The Corporation will have a clearing fund of not less than $10,000,000. Each member will be called upon for a contribution, the minimum to be $10,000, and the amount in each case to be fixed on the basis of the volume of the member's transactions, with readjustments from time to time if necessary. Members will be subject to extra liability equal to their contributions, to make good losses of the Corporation, should any occur. The funds will be deposited in banks and trust companies of the city. The Corporation's checks, like the present drafts of the Stock Exchange Clearing House, will not be certified, and will be accepted by the banks like the checks of other banks, without certification. Day loans will therefore be done away with in connection with all the transactions put through the Corporation.

The power of the Corporation to protect itself must and will be great. The daily itemized lists of security balances to receive and deliver, that are submitted by members to the Corporation, "shall have printed thereon an agreement whereby the Clearing Member pledges to the Stock Clearing Corporation all of the stocks and bonds in the list of securities to be delivered by him and all of the stocks and bonds in the list of securities to be received by him, as and when received,

to secure payment to the Stock Clearing Corporation of his debit balance on the day's transactions. . . ." Further, "the Stock Clearing Corporation shall have a lien for the amount of the debit balance of a Clearing Member on any and all securities held by it for his account. It shall have the right to borrow money and pledge for the re-payment thereof all or any part of the securities held by it for account of a Clearing Member either alone or together with securities held by it for account of other Clearing Members or otherwise and whether or not the amounts for which such securities are pledged shall exceed the debit balance of the Clearing Member," and in case of insolvency of a member, it may sell any securities held by it for the account of the member on the Stock Exchange or elsewhere. Finally, the Corporation's duly authorized representatives may at any time examine or inspect the books and records of clearing members.

Dealing with "Anticipated Results," the handbook of the Corporation says:

> It is expected that the operations of the Stock Clearing Corporation will reduce the demand for day loans from the certifying banks by at least 65 per cent and firms now maintaining bank balances for the purpose of securing such accommodation will be enabled to reduce their bank balances. Certification will not be entirely eliminated and reasonable bank balances will have to be maintained but it is expected that the reduction in the bank balances which it will be necessary for Clearing Members to maintain will offset their contributions to the Clearing Fund.

There will apparently be an assured reduction in the volume of day loans as soon as the Corporation begins to function, and even before the clearing of loans begins. This should be particularly the case where clearing firms have relatively large volumes of stocks to deliver and receive, with a relatively small net balance of money payment to make or receive. There will certainly be a decrease in money turnover from the start of operations. There is reason to believe that all the New York banking institutions that lend in Wall Street will find it to their advantage and in no important particular to their disadvantage to deal with the large, conservatively

conducted, responsible institution that the Stock Clearing Corporation should and undoubtedly will be, for a very large part of their stock exchange lending. There will of course be no difference whatever in the way negotiations for loans are carried on, or rates or other terms fixed; the only difference being that in the case of loans cleared through the Corporation, the latter will receive and make payments and deliver and receive collateral. On the other side, there is no question that all the important active trading brokerage houses will find it indispensable to belong to the Corporation. As these lines are written, there are still a number of houses now members of the Clearing House which have not signified their intention of becoming members of the Corporation; and it is not only likely but certain that some firms, hitherto inactive members of the Clearing House, will not find it worth their while to become members of the Corporation. But with a membership comprising all the stock exchange firms that swing large volumes of securities and money, and with the coöperation of all the important Wall Street banks, the Corporation can well look forward to effecting a saving of two-thirds of the present certification and "day loans."

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APPENDIX

THE GERMAN CAPITAL LEVY TAX: THE NATIONAL EMERGENCY TAX LEVY (REICHSNOTOPFER)

THE German National Constituent Assembly has enacted the following law, which, with the concurrence of the National Council, is hereby promulgated.

SECTION 1

To meet the extraordinary emergency confronting the nation, property holders (*der Besitz*) sacrifice a large levy on property, as specified hereinafter.

SECTION 2

The following are subject to the tax:

1. The citizens of the German Commonwealth, with the exception of those who, prior to July 31, 1914, in the interests of their business or for other urgent reasons, lived for an uninterrupted period of at least two years abroad, having no domestic domiciles, and who either are still residing abroad on the 31st of December, 1919, or within one year subsequent to the conclusion of peace again take up their residence, in the interest of their business, abroad.

This exception does not apply to National and State officials whose official residence is in foreign countries. Consular agents are not to be regarded as officials, within the meaning of this provision.

2. Persons who are not citizens of the Commonwealth and who are devoid of citizenship in any foreign country, in so far as they are domiciled within the limits of the German Commonwealth, or, in default of a German domicile, have a permanent residence here; also the citizens of foreign countries domiciled in Germany, or who have a permanent residence in Germany, and who have lost their German citizenship subsequent to the 31st of July, 1914.

3. Citizens of foreign countries who, in the interest of their business, are making Germany their permanent residence.

4. Domestic joint-stock companies, stock-companies *en commandité*, companies engaged in colonial trade, mining companies and other mining enterprises (the latter in so far as they are juristic persons), associations and partnerships with limited liability, mutual

insurance companies, registered associations issuing shares of the value of at least fifty marks, and rural, estate (*ritterschaftliche*) and similar credit-banks.

5. Other juristic persons under civil and public law.

6. Domestic properties not chargeable as part of the property of other tax-payers, especially the property of associations and of foundations not juristic persons.

Taxable obligation applies to the following classes of property:

1. In the cases of the tax-payers designated in Paragraph 1, Nos. 1, 2, 5, and 6, the entire property.

2. In the case of those designated in Paragraph 1, No. 3, the entire property with the exception of the foreign real property and operating property.

3. In the case of those designated in Paragraph 1, No. 4, the net property as estimated after deducting the paid-up or original capital. (Section 17.)

SECTION 3

Regardless of citizenship, domicile, residence, or seat of direction, all natural persons and legal bodies as well as bodies of property, together with their entire domestic real property and working-capital, and the compensations provided for in Article 297i of the Treaty of Peace,[1] are subject to levy, in so far as this does not conflict with the provisions of Section 2, Paragraph 2.

SECTION 4

In case taxable foreign real property or working-capital is subjected to a similar tax, this tax is to be deducted from the present levy, or, in case the latter has been already collected, is to be refunded.

The reduction or refund is to be made only for the amount of the tax apportioned to the foreign real property and working-capital.

SECTION 5

The following institutions are not subject to tax:

1. The States.

2. The municipalities and municipal associations of every type.

3. Churches, as well as ecclesiastical and religious associations.

4. Universities, academies, and similar institutions and associations; in addition, such institutions as, in case of the inadequacy of their resources, are permanently financed, wholly or in part, by the Nation, one of the States, or some other public corporation; also foundations whose purposes, in case of the inadequacy of their own

[1] Article 297i of the Treaty provides that Germany shall compensate her nationals in case property of theirs situate in Allied countries is sold or retained by the Allies.

resources, are wholly or partly subserved by the Nation, one of the States, or some other public corporation.

5. The National Bank, the National Loan-Banks, and the State banks.

6. Savings-banks which are public or open to the public, provided they confine their activities to the administration of actual savings transactions; also credit institutions founded and administered by public corporations and serving the public interest.

7. Chambers of Commerce, boards of trade, trade-unions, agricultural unions, and similar public bodies representative of occupational interests, as well as economic associations not public in character, whose purpose is not that of engaging in business pursuits.

8. Institutions which administer accident-insurance, invalid-insurance, and health and employment-insurance, as provided for by National statute.

9. Superannuation, widows', orphans', burial, sickness, and charitable funds, and funds of similar character.

10. Foundations, institutions, funds, and associations of individuals, provided they serve charitable purposes or further the interests of the general public, and do not restrict their activities to the service of the interests of a specified and limited group.

11. Political parties and associations.

The exemption provided for in Paragraph 1 applies only to domestic tax-payers.

SECTION 6

By property, within the meaning of the statute (i. e., taxable property), is understood — in the absence of any provision to the contrary — the sum total of personal and real property, as estimated after the deduction of all encumbrances. It includes:

1. Parcels of land, together with all appurtenances (real property: *Grundvermögen*).

2. Property which serves the purposes of agriculture, forestry, mining, or industry (operating property: *Betriebsvermögen*).

3. The sum total of all other property which does not come under the classification of real property or operating property. (Capital property: *Kapitalvermögen*.)

SECTION 7

On a par with real property (Section 6, No. 1) are those rights to which are applicable the provisions of the civil law relative to real property.

SECTION 8

Operating property (Section 6, No. 2) comprises all articles which serve the purposes of the enterprise.

The term operating property applies also to stocks produced in the course of the operation of the enterprise, and other stocks as well, intended for sale.

SECTION 9

Capital property (Section 6, No. 3) comprises more particularly — provided the individual property items do not come under Section 6, No. 1; Section 7; Section 6, No. 2; or Section 8 — the following classes:

1. Independent rights and claims.
2. Interest-bearing and non-interest-bearing obligations of every description.
3. Shares or certificates, mining shares, business balances with corporations, shares in businesses, and other investments of like character.
4. Specie of German coinage, foreign money, bank-notes and Treasury-bills, as well as gold and silver in bars.
5. The capital-value of annuities and other recurrent revenues and payments, which are due the claimant for the period of his own life or that of another, for an indefinite period, or for a period of at least ten years, and which are based either on a contract in consideration for the surrender of property-values or on a testamentary disposition, a gift, or a family settlement, or on the provisions of family-arrangement.
6. Rights which have not yet matured, based on insurance of a capital sum or of income, the revenue of which the holder has not begun to receive.

SECTION 10

The provision of Section 9, No. 5, does not apply to:

1. Rights against widows', orphans', and superannuation funds.
2. Rights arising from health or accident-insurance, National insurance, or the statutory insurance of employees.
3. Rights and similar dues, granted in consideration of work performed, or other services rendered, in the past.

SECTION 11

Taxable property does not include:

1. Household-furniture and other tangible personal-property items which do not come under the head of Section 9, provided they are not to be regarded as appurtenances of realty (Section 6, No. 1; Section 7) or as a constituent part of the operating property of an enterprise (Section 6, No. 2; Section 8).
2. Tangible personal property items, not intended for sale, made of precious metals (Section 12, No. 2), and possessing historical, artistic, or scientific value, provided they were in the posses-

sion of the owner or his family prior to July 31, 1914. These articles must, conformable to more specific administrative regulation, be made available for purposes of research and general education.

In case such articles are disposed of within thirty years subsequent to the 31st of December, 1919, the exemption from tax liability ceases.

SECTION 12

Taxable property comprises, however, the following:

1. Articles of precious metals, jewels, pearls, and art objects, decorative articles, luxuries, and collections of every description, acquired, for value, later than July 31, 1914; provided that the purchase-price of an individual article has equaled or exceeded five hundred marks, or, in the case of a group of similar or homogeneous articles, has amounted to one thousand marks or more.

2. Jewels, pearls, or tangible personal property items made of precious metals, provided they do not come under the provisions of No. 1, and provided that their total value exceeds the amount of 20,000 marks. These articles will be taxed at the rate of 10 per cent of their value.

In case they are sold within a period of thirty years dating from December 31, 1919, the entire amount of the tax falls due, at a rate estimated by including the property of the tax-payer on which the National Emergency Levy is based.

SECTION 13

The estimate of the property of the tax-payer shall include bequests made, either by himself or his wife, subsequent to the 31st of December, 1916, in the interest of relatives in the direct line of descent; but only provided the legatee's property still shows, on the day at which this act comes into force, an augmentation derived from the bequest. A status identical with that of bequests is assigned to property bestowed gratuitously, during the life-time of the one making the gift, provided the beneficiary is thereby enriched at the expense of the giver, and in accordance with the latter's intention. The acceptance of an equivalent does not conflict with the assumption of an accession of wealth, provided it is not a question of a return which possesses money-value.

To the property of those who are subject to the tax shall be added the amounts which the tax-payer or his wife has employed, subsequently to the 31st of December, 1916, in the establishment or endowment of a trust, provided the revenues derived therefrom accrue, wholly or in part, to the person subject to levy, or to his wife or issue.

The person liable for the payment of the tax apportioned to these amounts is the beneficiary.

SECTION 14

The additional amounts enumerated in Section 13 exclude the following:

1. Continuous bestowals (*Zuwendungen*) devoted to the proper maintenance or the education of the beneficiary.
2. Bestowals based on a legal claim on the part of the beneficiary.
3. Customary gifts, associated with particular occasions.
4. Bestowals to the value of less than one thousand marks, provided there is no ground for assuming intent to defraud the revenue.
5. Bestowals with respect to which the participants furnish credible testimony that there was no intent to defraud the revenue.

SECTION 15

From the amount of the property the following deductions are to be made:

1. Real and personal debts.
2. The amount of the charges resting upon the tax-payer, or incumbent upon a family property or trust, entailed estate, settled property, or any other obligated property, belonging to the class designated in Section 9, No. 5.
3. The amounts chargeable, according to the provisions of Section 13, to another tax-payer.
4. The amount of indemnity which has been paid — or is due — the tax-payer, as compensation for total or partial loss of his earning-power, resulting from physical injury or sickness; also the amount of a single payment which has been made, or which is due, enlisted soldiers on the basis of the act of September 13, 1919, providing for the compensation of soldiers and sailors who, in consequence of the curtailment of the military and naval forces, have been obliged to withdraw from the Army, Navy, and Colonial Forces.
5. The amounts of the levy due in accordance with the act of July 26, 1918, relative to an emergency war-levy for the fiscal year 1918; or with the act of September 10, 1919, relative to an emergency war-levy for the fiscal year 1919; or with the act of September 10, 1919 relative to a war-levy based on property-increments; provided that these amounts have not been paid by the day on which this act comes into force.[1]
6. Taxes and levies — State, municipal, and ecclesiastical — due for the fiscal year 1919, in so far as they have not been paid by the day on which this act comes into force.
7. The amounts, in specie, bank-credits or other assets, required, for the period of three months, for defraying current expenses dis-

[1] The act of July, 1918, imposed for the fourth year of war (war) property taxes on corporations and income taxes on individuals on the excess over pre-war amounts. The two acts of September 10, 1919 imposed similar taxes for the fifth year of war.

tinct from business or professional expenses, provided that these amounts are derived from the current annual income.

8. In the case of tax-payers whose taxable property does not amount to more than 150,000 marks, and who have no claim upon pension-funds or funds for the support of bereaved dependents:

(*a*) Between the ages of forty-five and sixty years, one-fourth.

(*b*) Over sixty years of age, one-third — of the taxable property up to the amount of 50,000 marks.

From the excess above 50,000 marks, up to 100,000 marks, a deduction of one-fifth is to be made for (*a*) and of one-fourth for (*b*).

This allowance will not be made, however, in cases where, in accordance with the terms of Section 27, Article 1, an extension of time has been granted for the payment of the entire levy, unaccompanied by any interest-requirements.

The following amounts may not be deducted:

1. Debts which have been incurred to defray current household expenses (household debts).

2. Debts and charges which have a business relation to property-items not subject to levy.

In case the tax is collected only on the inland real property and operating property (Section 3), those debts and charges only which stand in a business relation to such property items may be deducted.

Section 16

In estimating the tax, the property of husand and wife is treated as a unit, provided they are not permanently separated.

In settlement of the mutual financial relations of husband and wife, each of the two parties is to be regarded as responsible for that portion of the levy which corresponds to the figures which would be obtained by a separate assessment of his or her property.

Section 17

The taxable property of the companies designated in Section 2, Article 1, No. 4, comprises the sum total of the personal and real property of each; from this are to be deducted, apart from the debts and charges (Section 15), the following amounts:

1. The amount of the paid-up or original capital;

2. The reserve-funds which are designed to serve exclusively public or philanthropic ends, and whose use for such purposes may be regarded as assured.

3. In the case of insurance companies and insurance associations, the reserves used for insurance-funds, and for premium-surpluses to be refunded to the policy-holders themselves as so-called dividends.

In place of paid-up or original capital, there may be substituted:

(*a*) In the case of mining companies or other mining associations, an amount to be computed on the basis of the price of acquisition

and the costs of construction and development, less the outlay covered by the assumption of indebtedness; provided that, in place of the above amount, the Treasury Department may authorize, at the instance of those mining companies or other mining associations whose balance sheets include a capital account, the substitution of the stated capital as a basis for computation.

(*b*) In the case of registered coöperative organizations (*Genossenschaften*), as well as of limited-liability companies and joint-stock companies whose chief function is to serve as centrals for coöperative associations, twice the amount of the sums standing to the credit of the coöperators or twice the original capital of the companies; in the case of auditing organizations (*Revisions- und ähnlichen Hauptverbänden*), the property of the organization.

(*c*) In the case of mutual insurance companies, the paid-up original capital; in the case of rural, estate (*ritterschaftliche*) and similar credit-banks, the original property and that subsequently allotted.

SECTION 18

Parcels of land are to be assessed in accordance with the provisions of Section 152 of the National Tax Regulations, the ratio of the revenue to the capital value being estimated as twenty to one, not twenty-five to one.

In case the tax-payer sells, before the first of January, 1930, a piece of land which has been assessed on the basis of the amount of its revenue, he is to be reassessed for the land, provided the selling-price exceeds by one-fourth the tax-value assumed in connection with the assessment of the property-levy. The re-assessment shall be based on a valuation of the land represented by the selling-price less special expenditures made subsequent to the 31st of December, 1919, but not in excess of the market value on December 31, 1919.

SECTION 19

Operating property, in the case of those tax-payers who do not come under the provisions of Section 25, shall be assessed, after deducting operating charges, at only 80 per cent of its value.

SECTION 20

The value of real property and operating property within the limits of foreign countries, and outside the limits of the former German Empire, is to be estimated in terms of the currency of the country where the property is located; and, upon application by the tax-payer, may, for the purpose of computing the amount of the levy, be estimated in terms of German currency, at the rate of exchange which prevailed prior to the war; provided that the tax-

payer, or his testator, was in possession of this property as early as the 30th of July, 1914.

SECTION 21

Claims not yet due, arising from life-insurance and the insurance of capital and income based on contracts entered into subsequent to the 31st of July, 1914, shall be assessed at the full amount of the paid-up premiums or capital sums; provided that the annual premium exceeds one thousand marks, or the single capital-payment three thousand marks.

In case the disbursement is made, according to the terms of the contract, in the form of war-loan securities, the repayment is to be reckoned in accordance with the official quotations which apply to the war-loan of the 31st of December, 1919.

By capital-insurance, in the meaning of Paragraph 1, is meant any insurance on the basis of which the insured is guaranteed, under all circumstances, a given repayment of capital.

SECTION 22

For determining personal and property tax obligation, as well as for obtaining property-valuations, the 31st of December, 1919, is established as the determining date. Sections 147 and 151 of the National Tax Regulations do not apply.

The compensations provided for in Article 297i of the Treaty of Peace are not to be added to the estimate of the property-value until their amount has been determined; section 56 applies here, with the further provision that the term allowed for corrections and re-assessment dates from the settlement of the amount of the compensation.

In the case of enterprises which balance their accounts regularly each year, the financial status at the conclusion of the fiscal year which terminates during the period intervening between April 1, 1919, and March 31, 1920, may be used as the basis of estimate. The changes in the relation between the property invested in business operations and the other classes of property held by the tax-payer — such displacements having taken place between the conclusion of the above-mentioned fiscal year and the determining date — are to be taken into account.

In the case of corporations which, in accordance with the terms of the regulation of February 25, 1915 are exempted from the requirement of preparing a balance-sheet for the current fiscal year, the basis of estimate is to be the financial status at the end of the fiscal year to which the exemption no longer applies.

In assessing the property-levy, the property of the tax-payer, after the proper deductions and additions have been made, is to be stated in the lowest even thousands.

SECTION 23

Only the portion of the property over and above the amount of five thousand marks is subject to the tax. In the case of the joint assessment of the property of husband and wife (Section 16), the amount of the taxable property is reduced by an additional five thousand marks. The amount of taxable property is further reduced by the sums exempted in accordance with the provisions of Section 26, Paragraph 1.

This does not apply to the tax-payers designated in Section 2, Paragraph 1, Nos. 4–6, or to the persons and properties whose tax-obligation is based solely on Section 3.

SECTION 24

Taxable property is assessed — apart from the provisions of Section 25 — at the following rates:

On the first			50,000	marks	or	fraction	thereof	.....	10	per cent
"	"	next	50,000	"	"	"	"	.....	12	" "
"	"	"	100,000	"	"	"	"	.....	15	" "
"	"	"	200,000	"	"	"	"	.....	20	" "
"	"	"	200,000	"	"	"	"	.....	25	" "
"	"	"	200,000	"	"	"	"	.....	30	" "
"	"	"	200,000	"	"	"	"	.....	35	" "
"	"	"	500,000	"	"	"	"	.....	40	" "
"	"	"	500,000	"	"	"	"	.....	45	" "
"	"	"	1,000,000	"	"	"	"	.....	50	" "
"	"	"	2,000,000	"	"	"	"	.....	55	" "
"	"	"	2,000,000	"	"	"	"	.....	60	" "
"	further amounts							.....	65	" "

SECTION 25

In the case of tax-payers enumerated in Section 2, Paragraph 1, Nos. 4–6, as well as in the case of corporate bodies and the properties whose tax-obligation is based only on Section 3, the levy amounts to 10 per cent of the taxable property.

SECTION 26

In case the tax-payer has two or more children, or in case a married couple whose property is reckoned jointly (Section 16) has two or more children, there will be a deduction from the taxable property — apart from the exemption prescribed in Section 23, Paragraph 1, Sentence 1 — of five thousand marks for the second child and for each additional child.

Furthermore, the tax will be levied only at the rate of 10 per cent on as many times fifty thousand marks as there are children. The rest of the taxable property will be assessed at the rate per cent

which applies to the sum total of the taxable property, according to the terms of Section 24.

In case one of the children is already deceased, and has left issue, the deceased child is to be included.

In those cases in which joint reckoning is not to be made of the property of a married couple which has issue in common, the National Minister of Finance shall determine to what extent the individual parties are to be granted the allowances provided for in Paragraphs 1 and 2.

SECTION 27

In the case of a tax-payer whose taxable property does not exceed one hundred thousand marks and whose annual income does not exceed five thousand marks, the payment of all or part of the tax may, upon his request, be postponed, without payment of interest, if the tax cannot be collected without seriously undermining the means of subsistence of the party subject thereto. An extension of time may also be granted for the payment of the whole or a part of the levy, and without the collection of interest on the deferred payments, in case it appears, after due consideration of the economic status of the party liable to the levy, that the collection of the tax and the interest would impose an undue hardship. Application for extension will be treated under administration law.

The extension of time may, in case of demonstrated pecuniary straits, continue in effect — with reference to the whole or a part of the levy — up to the time of the decease of a surviving husband or wife.

The extension of time may be revoked, or modified as regards the manner, extent, or duration of the grant of respite, in case the circumstances of the tax-payer subsequently undergo modification, or if in the course of a review of the circumstances of the case an error is discovered the correction of which justifies an alteration of status.

In the cases designated in Paragraph 1, the tax may be remitted, wholly or in part, in so far as it affects the capitalized value of incomes (*Renten*).

SECTION 28

Everyone subject to the tax is required to submit a tax-statement. This applies to natural persons, however, only in case their taxable property, on the determining date, amounted to, or exceeded, five thousand marks.

The Treasury Department is authorized to demand of every tax-payer the filing, within a period of at least four weeks, of a tax-statement. In case a tax-payer who is living abroad frustrates or impedes the assessment of his property tax, through his failure to file his tax-statement within the period required, his domestic property may be attached.

SECTION 29

In case of doubt on the part of the Treasury Department as to the correctness of the tax-statement, it shall advise the prospective tax-payer to this effect, summoning him to make an explanation within a specified period.

Only in case the tax-payer fails to comply with this summons, or is unable to satisfy the Department officials, is it permissible in the assessment of the property to depart from the figures given in the tax-statement.

SECTION 30

The property-tax is subject to interest at the rate of 5 per cent, dating from January 1, 1920.

SECTION 31

In case the tax-payer does not pay the entire tax in a single sum, the amount not divisible by five hundred marks is to be paid by October 1, 1920; or, in case the notice of the assessment is not presented until after September 1, 1920, payment is to be made within one month dating from the time of the notification. Otherwise the property tax, including the interest due in accordance with the provisions of Section 30, is to be paid in the form of an annual amortization installment, at the rate of 6½ per cent of the amount of the levy.

These payments may be made, at the option of the tax-payer, either quarterly, semi-annually, or annually. The first payment is to be made together with the installment specified in Paragraph 1.

SECTION 32

Security may be demanded for the tax for the payment of which an extension of time, without interest-requirement, has been granted (in accordance with the provisions of Section 27), if the said postponement appears to endanger the later collection of the levy, and if the giving of security imposes no special hardship upon the tax-payer.

Surety for the amortization installments (Section 31) may be demanded only in case of repeated failure to pay the installments punctually, and if, in view of the character or financial status of the tax-payer, the payment of the tax appears dubious; or in case there are circumstances which justify the assumption that the tax-payer intends to impair the security offered by his property.

The Treasury Department shall determine the amount of the surety.

SECTION 33

Upon application by the tax-payer, an annual amortization installment to the amount of 5½ per cent of the tax apportioned to real property, after deduction of the debts and charges with which the

real property is encumbered, shall be entered as a recorded charge in the Land-Register (National Emergency Charge — *Reichsnotzins*). The tax is reduced by the capitalized amount of this National Emergency Charge.

The provisions of Section 31 are to be applied in principle in connection with the assessment and the payment of the amortization installments.

The registration of the National Emergency Charge, as well as modifications and cancellations, are to be effected free of stamp taxes, fees, or other costs.

SECTION 34

The amortization installments designated in Sections 31 and 33 may be paid off, in whole or in installments, on the first day of each quarter of the calendar-year.

The installments may not amount to less than two hundred marks. The amount of the levy which remains after the payment of an installment must be divisible by the sum of one hundred marks.

The amortization installment is to be recomputed without any reduction in the period set for the payment thereof.

SECTION 35

In case of the subdivision of a parcel of land encumbered with a National Emergency Charge, the latter is to be apportioned to the subdivisions, according to the value of the same as determined by the Treasury Department at the date of subdivision.

The Treasury Department may authorize the clearing of land-titles from encumbrances representing National Emergency Charge.

Entries in the Land-Register are to be correspondingly modified, upon application by the owner, upon his producing a certificate from the Treasury Department.

SECTION 36

In case a tax-payer, for the sake of making a cash-payment of the amount of the levy upon which is based a National Emergency Charge, negotiates with a public credit-bank or with one which is under the supervision of the State an amortization-loan to be repaid within a maximum period of fifty years, the bank in question having a first mortgage on the land, the mortgage to be deposited as security for the new loan — which is to be registered free of stamp taxes, fees, or other costs — shall take precedence of all other encumbrances.

The National Minister of Finance shall determine what institutions are to be regarded, within the meaning of this provision, as public in character or as subject to State supervision.

SECTION 37

Upon application by a tax-payer, that part of the levy apportioned to property-values estimated in terms of foreign currency is to be computed also in terms of the foreign coinage which is, for the time being, in question. This portion of the levy, as well as each individual installment to be paid in accordance with the provisions of Section 31, may be paid in the corresponding foreign currency. Detailed instructions for the execution of these regulations are to be issued by the National Minister of Finance.

SECTION 38

In the event of the death of the tax-payer, the amount of the levy which has not yet been liquidated by means of the installments designated in Section 31, becomes due in full, as a charge upon the estate of the deceased.

The Treasury Department is authorized to grant to the heirs a continuation of the amortization installments. This must be done in case there appears to be no question as to the security of the installments. The heirs may (in accordance with the provisions of Section 33) demand the registration of a National Emergency Charge for the devised property.

SECTION 39

In case the tax-payer abandons his permanent domestic residence, the amount of the property-levy which is not yet payable become immediately subject to collection, unless it has been entered in the Land-Register as National Emergency Charge, or the tax-payer gives security for the amount due.

This regulation is to be applied, according to the circumstances of the case, in the event of the liquidation or dissolution of a taxable corporate body, partnership, or estate.

SECTION 40

In case of bankruptcy, the outstanding amount of amortization installments and those due for the year in which the bankruptcy proceedings are opened, are on the same footing as the outstanding claims of the National Treasury, as designated in Section 61, No. 2, of the bankruptcy regulations of May 20, 1898.

SECTION 41

The tax-payer has the privilege of making advance payments on the amounts of the levy as yet unassessed. On the amount of the advance payment, annual interest is to be computed, in favor of the tax-payer, at the rate of 6 per cent, for the period intervening between the day of payment and January 1, 1920. The amounts of interest are to be stated in the lowest even marks.

The advance payments must be divisible by the sum of one hundred marks.

For cash payments made by June 30, 1920, a rebate of 8 per cent will be allowed; and for cash payments made between July 1 and December 31, 1920, a rebate of 4 per cent.

The advance installment of the levy, paid prior to January 1, 1920, will be added to the amount of the property as assessed for December 31, 1919.

Section 42

The tax may be paid either in cash, or in the form of other property-values, according to the provisions of Sections 43–46.

The surrender of non-interest-bearing Treasury bills (Treasury notes) is regarded as equivalent to cash-payment.

Section 43

Bonds, registered loans, and Treasury bills issued in connection with the National war-loans, will, if demonstrably subscribed to by the holder, be accepted, in lieu of payment, up to December 31, 1920; 5 per cent bonds, registered loans, and Treasury bills, bearing interest from January 1, 1920, at par; and 4½ per cent Treasury bills, bearing interest from the same date, at a rate to be determined and announced by the National Minister of Finance.

To the category of original subscription securities belong the bonds, registered loans, and Treasury notes which the tax-payer or — in accordance with the provisions of Section 16 — his wife has acquired, in consequence of subscribing to a war-loan, either in their own interest, or in that of a beneficiary (as per Section 13); or which the tax-payer or his wife has received from the bequest of a deceased person, in consequence of the latter's demise; or from an open partnership, limited-liability company, company *en commandité*, coöperative association, or syndicate, as a partner, associate, or member of the same; provided that the testator, partnership, company, or syndicate has secured these bonds, registered loans, or Treasury notes through a subscription to a war-loan, or the subscription was made on behalf of an association of joint-heirs including the tax-payer, or his wife.

The provisions of Paragraph 2 are to be applied, appropriately to the circumstances of the case, if the tax-payer has purchased the bonds, registered loans, or Treasury bills from a coöperative organization of which he became a member not later than July 1, 1919; provided that the acquisition-price did not exceed the amount of the sums which the partner subject to the levy had to his credit on December 31, 1919, and the organization acquired the bonds, loans, or Treasury bills through subscription.

To the category of original subscription securities belong, moreover, the bonds, registered loans, and Treasury notes received by a tax-payer in lieu of a legally enforceable dowry (*Aussteuer*); provided that the one making the dowry has acquired the bonds, loans and Treasury notes through a subscription.

It is reserved for the National Minister of Finance to receive in payment, for subsequent periods, securities of the type designated above, at a rate to be fixed by him.

Other bonds, registered loans, and Treasury notes of the German Commonwealth will be accepted in lieu of payment, up to December 31, 1920, at the established rates (*Steuerkurse*) and on the basis of their bearing interest from the 1st of January, 1920.

SECTION 44

The National Minister of Finance is authorized to extend the benefits of Section 43, Paragraphs 2 and 4, to those institutions and associations of individuals (including their members) which, in view of their business activities, have the same status as registered cooperative organizations, even tho lacking the legal form of the latter.

SECTION 45

In order to facilitate the payment of the tax for those subject thereto, an institution with a legal status of its own may be established.

The legal position of such institution will be determined by regulations fixed by the National Government, with the concurrence of a committee of ten persons chosen by the National Assembly from its own members.

SECTION 46

In case the institution accepts property values, the tax-payer will be exempted from the payment of the levy, to the amount of the credits set for the property (*Annahmewert*). In this case, the institution replaces the tax-payer in relation to the Commonwealth. The institution is under obligations to accept securities for the payment of the tax on war profits on the same terms as those on which it accepts securities for the payment of the National Emergency Tax.

SECTION 47

In case a parcel of land belonging to a tax-payer is acquired by a State, a municipality, a municipal association, or a colonising-association operating in the interest of the public or a building society, the party acquiring such property may assume the amount of the levy not yet paid by the person making the sale, up to the amount

of the cash-payment for the purchase. The person who makes the sale will then be exempted from the payment of the levy, up to the amount of the indebtedness thus assumed.

The relation toward the Commonwealth hitherto held by the tax-payer will then be assumed by the purchaser.

SECTION 48

In case a foreigner, subject to tax in accordance with the provisions of Section 2, Paragraph 1, No. 3, transfers his permanent residence to a foreign country, his obligations with respect to the payments designated in Section 31 are extinguished at the close of the year in which he changes his permanent place of residence. In case, however, the foreigner, in the interest of his business, returns to take up his permanent residence within the limits of the Commonwealth, the obligation is automatically revived, as regards the payment of that portion of the installments which, in case of uninterrupted residence within the limits of the Commonwealth, would have fallen due subsequently to the time of his return.

The provisions of Paragraph 1 do not apply to so much of the tax as is based on the amount of the domestic real property and operating property of the tax-payer as of December 31, 1919.

SECTION 49

[Summary: Unsettled estates in probate are to be taxed at the rate which would apply if they went to a single heir, all or part of the tax to be returned after the settlement, if the amount collected was excessive according to the status of the recipients.]

SECTION 50

[Summary: Holders of entailed property and the like are authorized to deduct the tax therefrom; and, under proper supervision by the courts, are to have such disposal of the property as this requires.]

SECTION 51

[Summary: Provisions affecting annuitants and the like, and those obligated to annuity payments].

SECTION 52

In case a testator, prior to the date on which this act goes into effect, has made a bequest without taking into account, in connection therewith, the curtailment of the amount of his property arising from his liability for the National Emergency Levy, the heir is authorized to decline to fulfill the terms of the legacy, to such an extent as shall, by reducing the assessment on this property, cause

the tax to be borne in corresponding ratios by himself and the legatee.

The same provision applies to charges on an estate.

In case the payment due a legatee is curtailed, by reason of the provisions of Paragraphs 1 and 2, he may curtail, proportionately, the charges imposed upon him.

The provisions of Section 51 remain unaffected.

SECTIONS 53 AND 54

[Summary: Further provisions for apportionment of the tax between heirs and legatees in special cases.]

SECTION 55

Joint-stock companies, companies *en commandité*, and limited-liability partnerships, as well as registered coöperative associations, may draw on their legal reserves for the cash-payment of the tax or any part of it.

SECTION 56

In the event of an overestimate or underestimate of the property-levy, in a given case, corrections and re-assessments may be made within the period of three years. It is not necessary that new facts or evidence, such as warrant re-assessment, shall meanwhile have been ascertained.

The tax-rates and assessed values fixed for December 31, 1919, and published accordingly, are only provisional. During the course of the three-year period designated in Paragraph 1, these tax-rates and assessed values shall be tested and redetermined in accordance with detailed regulations adopted by the National Council. In case the new determination of rates and valuations deviates from the provisional determination, immediate notice is to be given.

SECTION 57

On application by the tax-payer, the property-levy shall be adjusted to the amount of the property in accordance with re-assessments to be made as of the 31st of December, 1920, 1921, and 1922; provided that the tax-payer gives evidence to the effect that his property has diminished by more than one-fifth, as compared with its status for December 31, 1919, as a result of the alienation, for value, of property-items, or in consequence of the loss or depreciation of portions of the property, or because of unusual reverses.

SECTION 58

Whoever is guilty of defrauding the government of the revenue due in accordance with the provisions of this act, will be subject to a

fine ranging from the amount of the sum fraudulently withheld to three times the amount of the same.

SECTION 59

The National Minister of Finance is authorized, in exceptional cases where unusual difficulties would arise in connection with the assessment of the exact amount of the property, to arrive at an agreement with the tax-payer, whereby the tax may be assessed in a lump sum; and in this way, in the interest of the public welfare, to make due provision as regards the pledging of the property.

SECTION 60

In the case of all tax-payers who, in consequence of the war, have lost articles of clothing or household furniture, and have not as yet replaced any of these articles, the property is exempt from levy, to the amount of the value of said articles of clothing and household furniture, but not to an amount in excess of fifty thousand marks.

In case these articles, or a portion of the same, have been sold under hostile compulsion, the amount by which their value exceeds the proceeds of the sale is regarded as lost. The proceeds are exempt from taxation. But the value of the lost articles is exempt from taxation only in case the sum of their value and the proceeds of the sale does not exceed fifty thousand marks.

SECTION 61

The proceeds of the National Emergency Levy are to be applied in accordance with further provisions in the National Budget.

SECTION 62

The regulations for the execution of the provisions of this act will be promulgated, the National Council concurring, by the National Minister of Finance.

The President of the Commonwealth,
EBERT.

The National Minister of Finance,
ERZBERGER.

BERLIN, December 31, 1919.

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